COMMERCIAL FISHERIES ABSTRACTS

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0.33 SOLUBILITY OF RABBIT MUSCLE PROTEINS AFTER VARIOUS TIME-TEMPERATURE TREATMENTS

Paul, Pauline C., Lis Buchter, and Annemarie Wierenga (Department of Home Economics, University of California, Davis)
Journal of Agricultural and Food Chemistry 14, No. 5, 490-492 (September-October 1966)

Studies on the major alterations in proteins caused by heat are usually made on isolated proteins, so that little information is available on the chemistry of changes that occur in the structural proteins of voluntary muscle when heated in situ. Proteins are much more resistant to heat in the muscle structure than when they are isolated. Histological studies have shown that major alterations in proteins caused by heating occur in the structural organization of the contractile and connective tissue proteins, and in the staining properties of the collagenous fibers. The present study was initiated to define the chemical changes involved when proteins are heated. The first phase was to separate the total protein sarcoplasmic, myofibrillar, denaturated, and stroma fractions in the longissimus dorsi muscle of rabbit and to ascertain how these fractions are altered by heat treatment.

With increasing temperature or with increasing time at a given temperature, the amount of nitrogen-containing compounds extracted in salt solutions decreased,
(over)

 ABSTRACTER: M. F. Tripple

0.5 AGAR CONCENTRATION IN COUNTING CLOSTRIDIUM COLONIES

Eller, Charles, Losson Rogers, and E. Staten Wynne (Microbiology Section, USAF School of Aerospace Medicine, Brooks Air Force Base, Texas)
Applied Microbiology 15, No. 1, 55-57 (January 1967)

The relatively small size and abundant gas production of subsurface colonies of Clostridium make counting these colonies difficult. It is known that lower concentrations of agar support larger colonies of certain microorganisms. The authors have investigated the effect of agar concentration on the size and distinctness of colonies of Clostridium in a modified counting medium developed by Wynne, Schmieding, and Daye (1955).

Clostridium botulinum, C. sporogenes, and C. perfringens were examined in this study. Reducing the agar concentration in the above-mentioned counting medium produced much larger colonies and less difficulty from gas with C. botulinum and C. sporogenes.

C. botulinum produced dotlike colonies after 24 hours' incubation at 37° C. on 1.5 percent agar. With C. botulinum, the size of the colonies gradually increased as the agar concentration was reduced. In 0.50 percent agar, growth was diffuse; 0.65 percent agar was found to be the optimum concentration. Longer incubation did little to improve the ease of counting colonies, nor did it increase the number of colonies. With 1.5 percent agar, gas production produced
(over)

 ABSTRACTER: E. R. Weissman

0.36 (*) PROTEIN ALTERATIONS AND ASSOCIATED CHANGES IN PORCINE MUSCLE AS INFLUENCED BY MATURITY, GENETIC BACKGROUND, AND POST-MORTEM MUSCLE TEMPERATURE

Sayre, R. N., Joan Para, and E. J. Briskey (American Meat Institute Foundation, Chicago, Illinois; and Department of Meat and Animal Science, University of Wisconsin, Madison 53706)
Journal of Food Science 31, No. 6, 819-824 (November-December 1966)

The purposes of this experiment were to (1) study the effects of animal maturity on post-mortem changes in the chemical and physical characteristics of muscle and (2) determine the extent to which solubility of muscle protein and the associated properties of juice retention are influenced by breed of pork and holding temperature of the carcass. Stage of maturity, genetic background, and post-slaughter holding temperature were studied in relation to the effects of these variables on the rate of post-mortem glycolysis, change in gross muscle morphology, and alteration of muscle protein solubility.

Muscle from 5- to 10-kilogram pigs tended to have more glycogen and less myoglobin and less total nitrogen than did muscle from 250- to 300-kg. pigs. The rate of glycolysis appeared to be slightly faster in the post-mortem muscle of mature pigs than in muscle from immature pigs. Differences in glycolytic rates among weight groups were minor. Muscle from mature animals showed a greater loss of color after slaughter than did the muscle from immature pigs. The solubility
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 ABSTRACTER: M. M. Gwin

0.5 (*) HEAT-LABILE ENZYMES IN A PSYCHROPHILIC BACTERIUM

Purohit, K., and J. L. Stokes
Journal of Bacteriology 93, No. 1, 199-206 (January 1967)

Psychrophilic and mesophilic microorganisms are differentiated on the basis of the temperature range at which they grow best. Mesophiles can only grow at temperatures greater than about 10° C., whereas psychrophiles can grow at temperatures lower than 0° C. On the other hand, psychrophiles have a maximum growth temperature of between 25° and 30° C., compared to a maximum of temperature between 35° and 50° C. for most mesophiles. The lower maximum temperature at which psychrophilic bacteria can grow may be due to the fact some of their enzymes are more sensitive to heat than are the enzymes of mesophilic bacteria.

It has been shown that both the formic hydrogenlyase and hydrogenase in a gram-negative, rod-shaped, motile, psychrophilic bacterium (designated as strain 82) are much more sensitive to heat than the corresponding enzymes in Escherichia coli and other mesophilic bacteria. Strain 82 would not synthesize formic hydrogenlyase and hydrogenase above 20° C., whereas E. coli and other mesophiles could synthesize these enzymes at 45° C. It was found that once synthesized, formic hydrogenlyase of strain 82 was completely inactivated at 45° C. The corresponding enzyme in E. coli maintained activity up to 70° C. The hydrogenase of strain 82 was also more sensitive to heat than the hydrogenase of E. coli. In the present study, a search was made to find other heat-sensitive enzymes in strain 82.
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 ABSTRACTER: E. R. Weissman

EFFECT OF HEAT ON MUSCLE PROTEINS

PROTEIN ALTERATIONS IN PORCINE MUSCLE

COUNTING CLOSTRIDIUM COLONIES

HEAT-LABILE ENZYME IN PSYCHROPHILIC BACTERIA

0.5 DEVELOPMENT CHANGES DURING THE FORMATION AND BREAKING OF THE DORMANT STATE IN BACTERIA

Halvorson, Harlyn O., James C. Vary, and William Steinberg (Univ. of Wisconsin, Madison)

Chemical Abstracts 66, No. 3, 8889n (January 16, 1967)

0.5

Nicotinamide adenine dinucleotide ($NADH_2$) oxidase and cytochrome c reductase in strain 82 were rapidly inactivated by heating at 46° C. The oxidative and fermentative metabolism of strain 82 were completely destroyed by subjecting the cells to a temperature of 46° C. for about 1 hour. E. coli cells and their $NADH_2$ oxidase and cytochrome c reductase were virtually unaffected by similar treatment. Other enzymes in the bacteria were not critically affected.

Psychrophilic bacteria do not require all these heat-sensitive enzymes and enzyme-forming systems in order to grow. Strain 82 can grow without formic hydrogenlyase and hydrogenase and Pseudomonas fragi can grow without lipase. Some of the heat-sensitive enzymes are necessary to the growth of psychrophiles; strain 82 appears to require $NADH_2$ oxidase and cytochrome c reductase for aerobic growth. These heat-sensitive enzymes and enzyme systems of psychrophilic bacteria may function better at low temperatures than the corresponding relatively heat-stable enzymes of mesophilic bacteria. This ability may explain why the psychrophilic bacteria can grow at low temperatures.

0.36 ACRYLAMIDE GEL DISC ELECTROPHORETIC PATTERNS AND EXTRACTABILITY OF CHICKEN BREAST MUSCLE PROTEINS DURING POST-MORTEM AGING

Maier, Gilbert E., and Robert L. Fischer (Basic Research Department, Campbell Soup Company, Camden, New Jersey 08101)

Journal of Food Science 31, No. 4, 482-487 (July-August 1966)

The proteins of the muscle of chicken breast were studied during post-mortem aging. Electrophoretic patterns of water-soluble extracts consistently showed fast-moving bands, which increased in intensity with post-mortem aging. Patterns of the salt-soluble and the urea-soluble extracts evidenced no such changes.

Unbuffered, water-soluble proteins were not as easily extracted at 24 hr. post mortem as at 30 min. post mortem. The percentages of salt-soluble and urea-soluble proteins and dialyzable peptides in the water-soluble extracts remained relatively constant throughout the 24-hr. post-mortem period.

[Abstracter: L. Baldwin]

0.33

the amount of compounds soluble in 0.1 N NaOH increased, and the amount of stroma remained relatively constant. The change was more rapid in the soluble fractions as the temperature increased.

From 2 to 10 hours, the amount of nitrogen in the sarcoplasmic fractions increased at 50°, 55°, and 60° C., the myofibrillar protein increased at 45°, 50°, and 55° C., and the heat-denatured protein decreased at 50°, 55°, and 60° C. Because these temperatures are known to increase enzymic activity, changes in solubility could be the result of proteolytic enzymes naturally present in muscle tissue. The parallel increase in nonprotein nitrogen of the sarcoplasmic fraction at these temperatures tends to support this conclusion.

An increase in nitrogen in the stromal residue at longer times at 75° and 80° C. parallels an increase seen in beef muscle. This increase may be due to insolubilization of some of the protein constituents by the extreme heat treatment.

The nonprotein nitrogen content of the sarcoplasmic fraction was uniform, with the exception of samples held for 10 hr. at 50°, 55°, and 60° C. After being heated at 60° C. or higher, the sarcoplasmic fraction consisted mainly of nonprotein nitrogen. However, even after 10 hr. at 80° C., a small amount of protein nitrogen remained in this fraction, which suggested that a small part of the total enzyme system of the muscle is resistant to heat.

The pH of the muscle tissue increased with heating; it increased more rapidly and to a higher level as the temperature was increased. The maximum change in pH at 40° C. was <0.1; from 45° to 65° C., the maximum change was between 0.2 and 0.3; and at 70° to 80° C., the change was about 0.4. [13 references]

POST-MORTEM CHANGES IN CHICKEN MUSCLE PROTEINS

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cracks in the medium; whereas at lower concentrations the gas was more diffusible, collecting between the counting medium proper and the agar seal.

C. sporogenes required a longer incubation period and an even lower concentration of agar than did C. botulinum. After 48 hours, the number of colonies increased by about 10 percent over the 24-hour count. Furthermore, at 24 hours incubation, varying the agar concentration between 0.40 percent and 1.5 percent had no effect on colony size. After 48 hours' incubation, however, the colonies on 0.30 percent agar were too diffuse for accurate counting, as were those on 0.40 percent agar; 0.50 percent agar was found to be most suitable. Gas formation was less of a problem with this species than with C. botulinum.

C. perfringens remained difficult to count, even at agar concentrations as low as 0.20 percent. Extensive gas production by this species made counting colonies difficult. Of the three species under examination, C. perfringens was the only nonmotile species. Since motility was considered to be the reason for increased colony size in softer agar, the failure of C. perfringens to grow larger colonies in lower concentrations of agar was understandable.

It was expected that in the case of two motile organisms, such as C. botulinum and C. sporogenes, the one with the greater motility would require a higher concentration of agar to maintain discrete colonies. This was shown to be the case with C. botulinum, which had the greater motility.

REVIEW OF SPOROGENESIS

1.0141 NORWAY: ANOTHER FANTASTIC YEAR!

Anonymous
World Fishing 16, No. 2, 31-32 (February 1967)

For the fourth year in a row, Norway has increased her total catch of fish. The 1966 catch of 2,637,000 tons of fish exceeded the 1965 catch by 27 percent in quantity and 18 percent in wholesale value. This record was accomplished despite a 2-month ban on fishing for herring and mackerel for meal and oil production. Since 1962, the low point in a 6-year Norwegian fishing slump, fish production has more than doubled and value has nearly doubled. The main reason for the Norwegian industry's recovery is the revival of the purse seine fishery for pelagic species.

The purse seine fleet accounted for 90 percent of all landings of pelagic species, and it is about this proportion of the pelagic catch that is used for the production of meal and oil. The Norway pout and sand eel were included in the table to give an accurate picture of the complete raw material basis

Norwegian catch of fish for meal and oil (in 1,000 metric tons)

Type of fish	1964	1965	1966
Herring and sprat	746	1,089	1,194
Capelin	19	217	380
Mackerel	51	158	477
Norway pout	85	51	25
Sand eel	10	5	19
Total	911	1,520	2,095

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 ABSTRACTER: E. R. Weissman

1.018 THE SOUTH PACIFIC LONG-LINE FISHERY FOR ALBACORE TUNA, 1954-64

Otsu, Tamio (Bureau of Commercial Fisheries, Biological Laboratory, Honolulu, Hawaii)
Commercial Fisheries Review 28, No. 7, 9-12 (July 1966)

In January 1954, seven Japanese tuna vessels began longline fishing around American Samoa to supply tuna to a newly reopened cannery on Tutuila Island. By 1963, a second California tuna-packing company began canning tuna in American Samoa. From the original seven vessels, the fleet supplying fish to the Samoan canneries grew to about 100 in 1963. The composition of the fishing fleet, in terms of the country of origin of the vessels, has changed over the years. In the early years of the fishery, the fleet was composed entirely of longliners from Japan. In 1962, vessels from the Republic of Korea began operating in the area, and in 1964, vessels from the Republic of China joined the fleet.

At the outset of the fishery in 1954, the vessels fished relatively close to American Samoa in an area of about 100,000 square miles. By 1956, considerable fishing already took place as far south as latitude 28° S., in waters southeast of the Tonga Islands. The greatest expansion of fishing grounds was in 1958, however, when vessels extended the fishing eastward to the vicinity of the Marquesas Islands. Presently, the vessels are fishing in an extensive area from the Equator in the north to as far south as 30° S., and from about 175° E. longitude in the west

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 ABSTRACTER: E. R. Weissman

1.01512 INDIA

Anonymous
Current Affairs Bulletin, Indo-Pacific Fisheries Council, No. 47, 19-22 (December 1966)

India and the Soviet Union have reached an agreement on Soviet assistance in developing India's deep-sea fisheries. India is to receive two different types of deep-sea fishing vessels from the U.S.S.R. on an experimental basis. India will decide which vessel is better suited to her needs, and the Soviet Union will then supply large numbers of this vessel. The Indian crews for the vessels will be trained by the U.S.S.R. The Soviet Union has also agreed to help India build a shipyard for the production of fishing vessels.

A plan to develop Sassoon Dock, Bombay, into a harbor capable of handling 300 small and medium-sized fishing vessels and 15 large fishing vessels has been approved by the State Fisheries Advisory Board. Included in the plan are provisions for an ice and cold-storage plant and for a processing and freezing plant. The lack of adequate space for landing fish in Bombay has brought the fishing industry there to a standstill. Also announced were plans to build another fisheries harbor in Versova village, and a possible three-stage plan to be undertaken with Yugoslavia. The first stage would include the provision of a research vessel and 10 trawlers, the second stage would involve 2 canning plants, and the third stage would involve a shipbuilding yard. Details of the first stage are now being considered.

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 ABSTRACTER: E. R. Weissman

1.81 WILLAPA OYSTER STUDIES -- USE OF THE PASTURE HARROW FOR THE CULTIVATION OF OYSTERS

Sayce, Clyde S. (Washington Department of Fisheries, Ocean Park, Washington), and Charles C. Larson (Alaska Department of Fish and Game, Juneau, Alaska)
Commercial Fisheries Review 28, No. 10, 21-26 (October 1966)

The English pasture harrow is used in oyster cultivation to break apart and scatter clusters of oysters. It is also used to prepare oysters for harvest by loosening them from the substrate and removing fouling growth. Use of the harrow has virtually eliminated breaking and scattering by hand during low tide and has saved the grower considerable expense. Although the use of the harrow in oyster farming has increased during the past few years, its effect upon oysters has not been investigated. The present paper reports the results of such an investigation.

The harrow is dragged from an "A" frame mounted on either an oyster scow or a tow boat and raised and lowered by winch, powered or unpowered. Only one person, the boat operator, is usually needed for either arrangement, since the harrow may be dragged continuously except when beds are heavily covered with eel grass or moss. At such times, an additional man is needed to raise the harrow for frequent cleaning.

A survey area consisting of four lanes 65 by 200 feet was laid out. One lane was designated the control lane and the others numbered 1, 2, and 3. During

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 ABSTRACTER: E. R. Weissman

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The Central Institute of Fisheries Technology Annual Report, 1965-66, describes fisheries research carried on in India during that period. The report includes the following information on fish processing and quality control,and on gear and vessel development;

The Preshipment Inspection Scheme was extended to include the compulsory inspection of frozen frog legs before shipment. Research was conducted on the suitability of the different local varieties of commercial fish for freezing and frozen storage; transportation technology; preparation of delicatessen products from fish and shellfish; methods of preserving fish; and on biochemistry and bacteriology relevant to fisheries. Several new driers for salt-cured fish and fish meal were developed, including a hand-operated model for use in areas where no electricity is available.

Experiments on various new designs of fish gear were conducted. Among the nets tested were a long-winged shrimp trawl, a midwater trawl, and a high-opening fish trawl. Developments were made on improving the quality of native hemp twines to replace imported Italian twines. Investigations were conducted to find a native substitute for imported Dammar Battu that is used to coat the hulls of wooden fishing boats. Several indigenous resins appeared to be suitable substitutes.

1.81

the experimental harrowing period, the control lane was never dragged, lane 1 was dragged only once, lane 2 was dragged once each week, and lane 3 was dragged during the beginning, middle, and last week (for a total of three times). The condition of the oysters in all lanes was similar before dragging began. At the end of the sampling period, control-lane oysters had the lowest condition index, whereas oysters in the three dragged lanes were in an identically higher condition.

In lane 2, the physical disturbance of the oysters produced mass spawning. Pacific oysters spawned shortly after being dragged, whereas undragged oysters spawned later. Lanes 1 and 3 showed evidence of partial spawning and then of more spawning after initial dragging; recovery of oysters appeared to be less erratic in these lanes than in the control lane. Dragging did not materially increase mortality among the oysters.

Since harrowing to remove fouling organisms from old oysters and shell would be an inexpensive way to prepare ground for spatfall, shell samples were taken from each lane after the 1964 setting season to determine setting according to the amount of dragging. The control-lane shell had the lowest count (0.6 spat per shell). Lanes 2 and 3 had spat counts of 3.1 and 3.2 spats per shell, respectively. Lane 1 had 1.7 spats per shell. These records indicate that dragging only once improved the setting of Pacific oysters on old shell, and dragging three times greatly improved spatfall, but dragging more than three times did not further improve spatfall.

1.0141

of the meal and oil industry. About 90 percent of Norway's entire catch is used by the meal and oil industry, and the dependence of the fishing industry on this market has caused some concern. Prices on the international oil and meal market dropped in 1966, which caused the ban on landing pelagic fish for the meal and oil plants. It is felt that other outlets for the catch should be found to prevent another ban.

Landings of demersal fish also increased during 1966: 219,000 tons of cod were landed, which was 19,000 tons more than in 1965; haddock landings rose from about 50,000 tons in 1965 to about 60,000 tons; saithe and ling cod landings rose slightly; and tusk landings dropped slightly. Landings of halibut, dogfish, and deepwater prawns declined in 1966.

Saithe (or coley) are receiving increasing attention because stocks of this species are thought to be greater than those of cod and because these fish are important to the fillet-freezing industry. Saithe are also used in making dried fish for export. The demand for saithe was so great in 1966 that fish had to be imported from Canada and the Faroe Islands to supplement local supplies. The export of frozen-fish fillets also rose considerably.

1.018

to as far east as longitude 120° W., or an area of about 8 million square miles. Vessels fish as far as 3,000 nautical miles from their base.

Except for the first few years, when yellowfin tuna dominated the catch, albacore has been the predominant species in the catch. Albacore tuna are being delivered to the canneries in a ratio of about 4:1 by weight over yellowfin. Among the tunas, albacore usually commands the highest price; therefore, commercial fishermen have geared their effort towards catching that species. Fishing grounds are selected where albacore are most plentiful and not necessarily where the greatest aggregate total of tuna of all species can be caught.

The available data indicate that the catch of albacore tuna has decreased in recent years, mostly in terms of weight of fish taken per unit of fishing effort (one unit equals one fishing trip). It appears that the decline has been caused primarily by (1) some presently unexplainable movement of larger fish away from the areas of the fishery, particularly during February-May of 1964, and (2) the entrance into the fishery in early 1964 of an abundant year-class. A preliminary analysis of the data suggests that the strong year-class contributed in large part to the decline in catch (weight) per unit of effort. If so, it may be expected that the catch per unit of effort will rise in subsequent seasons as the large year-class passes through the fishery.

2.01 BACTERIOLOGICAL SURVEY OF THE FROZEN PREPARED FOODS INDUSTRY II - FROZEN BREADED RAW SHRIMP

Surkiewicz, Bernard F., James B. Hyndman, and Mary V. Yancey (Division of Microbiology, Food and Drug Administration, U. S. Department of Health, Education, and Welfare, Washington, D.C.; and Food and Drug Administration, Dallas, Texas)
Applied Microbiology 15, No. 1, 1-9 (January 1967)

This report is part of a continuing bacteriological survey of the frozen food industry in the United States, and reports on that phase of the survey concerned with frozen breaded raw shrimp. Headless, frozen shrimp are thawed, peeled, deveined, and washed in preparation for breading. The prepared shrimp are conveyed through a liquid batter and through a heavy sprinkling of dry breading material. This process is repeated until the breading constitutes about 50 percent of the total weight of the product. The shrimp are either hand packed in cartons and frozen or frozen on trays and then packaged.

Both raw shrimp and the batter are good growth media for bacteria. The samples of dry batter mix were found to contain low levels of bacteria. In plants where the liquid batter was kept chilled and was discarded at least once during the work period, the liquid batter samples did not show a significant increase in bacterial content over that found in the dry mix. In plants that did not chill or discard the liquid batter, significantly higher plate counts of bacteria were recorded.

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 ABSTRACTER: E. R. Weissman

2.05 SEROLOGICAL STUDIES OF CLOSTRIDIUM BOTULINUM TYPE E AND RELATED ORGANISMS

Lynt, R. K., Jr., H. M. Solomon, D. A. Kautter, and T. Lilly, Jr. (Division of Microbiology, Food and Drug Administration, Washington, D.C.)
Journal of Bacteriology 93, No. 1, 27-35 (January 1967)

Species and strains of the genus Clostridium are usually classified on the basis of their morphological, cultural, and physiological characteristics and, when applicable, by identification of their toxins. Because nontoxigenic strains of Clostridium sometimes resemble toxin producers and because variations in morphology and physiology exist between toxigenic strains, it may be difficult to classify these strains. More specifically, nontoxigenic strains agglutinated by antisera produced against toxigenic clostridia present a problem of classification. Only limited investigations of the serological classification of strains of C. botulinum Type E have been conducted. Both somatic agglutination tests and a fluorescent-antibody technique are equally specific and can be used to distinguish Type E from other types of C. botulinum. Nontoxigenic strains have not been tested by these two methods. The purpose of this investigation was to determine if serological methods, other than toxin neutralization tests, can be used to identify C. botulinum Type E and distinguish this type from organisms that resemble it.

(over)

 ABSTRACTER: M. M. Gwin

2.05 (*) CLOSTRIDIUM BOTULINUM TYPE E IN FROZEN VACUUM-PACKED FISH

Insalata, N. F., G. J. Fredericks, J. H. Berman, and E. Borker (General Foods Corporation, Technical Center, White Plains, New York 10602)
Food Technology 21, No. 3, 78-80 (March 1967)

The present article reports on the extent to which Clostridium botulinum Type E was found in commercial samples of vacuum-pouch-packed raw frozen flounder from Atlantic waters. The effects of preparation and abnormal storage conditions on the formation of C. botulinum exotoxin are also reported.

One hundred pouches of frozen flounder were cooked according to recommended recipe procedure and were then stored for up to 4 weeks at 10° C. The samples were inoculated with Type E spores. No deaths resulted from inoculating test animals with extracts from these samples. The samples were then enriched and the test animals were again inoculated. In this case, death resulted with extracts from 10 of the samples and the deaths were attributed to Type E exotoxin. This test demonstrated that Type E spores were present in the 10 samples and that the spores either had not previously produced free exotoxin or had produced exotoxin that was destroyed by the heat of preparation.

In another series of tests, samples of flounder were prepared and were inoculated with C. botulinum spores that were heat treated to simulate the conditions

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 ABSTRACTER: E. R. Weissman

2.05 (*) EXAMINATION OF PREPARED FOODS IN PLASTIC PACKAGES FOR CLOSTRIDIUM BOTULINUM

Taclindo, C., Jr., T. Midura, G. S. Nygaard, and H. L. Bodily (Microbial Diseases Laboratory and Division of Laboratories, California State Department of Public Health, Berkeley)
Applied Microbiology 15, No. 2, 426-430 (March 1967)

Clostridium botulinum is an anaerobic, spore-forming microorganism that produces the toxins causing botulism. Of the six distinct serotypes of this organism, Types A, B, and E are most often implicated in cases of human botulism. Clostridium botulinum can multiply and produce toxin in a wide variety of foods. Type E may constitute the most serious hazard in foods stored at low temperatures because it is capable of growth and toxin production at temperatures lower than those at which A and B can function. It is possible that vacuum packaging of foods has been a major factor in Type E outbreaks in the United States though Johannsen (1965) concluded that vacuum packaging itself had little effect on the ability of C. botulinum Type E to produce toxin.

The present survey was undertaken to determine (1) to what extent C. botulinum occurs in a variety of "vulnerable" foods--that is, in foods that are sold from a cooled or refrigerated case and require little or no heating prior to being consumed--and (2) whether these foods will support the growth and toxin production of C. botulinum if it were initially present. In addition, the authors

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 ABSTRACTER: E. R. Weissman

BACTERIOLOGICAL QUALITY OF BREADED SHRIMP

CLOSTRIDIUM BOTULINUM IN FROZEN FISH

IDENTIFYING CLOSTRIDIUM BOTULINUM TYPE E

CLOSTRIDIUM BOTULINUM IN PACKAGED FOODS

of preparation. Twenty of these samples were incubated at 10° C. for up to 5 weeks. None of the samples showed free exotoxin of C. botulinum; however, enrichment of the samples led to the production of toxin, which demonstrated the viability of the heat-treated innoculated spores.

Twelve inoculated samples were stored for 3 days at 21°-26° C. After this period of storage, all 12 pouches were swollen by gas production. Half of the pouches were analyzed and were found to contain Type E toxin. The other half of the pouches were prepared and tested. These pouches contained no exotoxin, which demonstrated that Type E toxin was destroyed by exposure to the recommended time-temperature relation of preparation.

The results of this study showed that spores of C. botulinum Type E can be found in vacuum-pouch-packed frozen fish from the North Atlantic. The spores are native to the fish and are able to survive the conditions of processing. The major danger from C. botulinum is the presence of the exotoxin in food, rather than the presence of the spores. Even under abusive storage conditions, spores may occur in fish without the production of exotoxin. The exotoxin produced in the inoculated samples of the fish was destroyed by the conditions of recommended preparation. The authors conclude that there is little risk of botulism from vacuum-packed frozen, raw fish. [16 references]

Meisel, Henryk, Henryka Albrycht, Danuta Rymkiewicz, Alicja Switalska, and Paulina Tremowler
Chemical Abstracts 66, No. 11, 44408f (March 13, 1967)

2.01

Several investigators have reported that the number of bacteria in freshly caught shrimp depends on the amount of washing the shrimp received. The researchers found that large quantities of bacteria were carried on the surface of the shrimp.

The bacteriological quality of the headless shrimp purchased by all the firms included in this survey was found to be essentially the same. The breading material at the various plants always contained lower levels of bacteria than did the corresponding shrimp and batter. The authors recommend that the breading material be periodically discarded to prevent an increase of moisture that would support bacterial growth.

Since only three ingredients--shrimp, liquid batter, and breading--are required to produce raw breaded shrimp, and since the breading material was found to have a relatively low bacterial content, it was expected that breaded shrimp would have a lighter bacterial load than the shrimp purchased by the processor. This was found to be the case with breaded shrimp processed in plants where good sanitary practices were maintained. On the other hand, the shrimp processed in plants with poor sanitary conditions had higher levels of bacterial contamination than did the raw shrimp entering the plant.

The authors note that the sanitary practices of many of the plants included in this survey improved once the importance of sanitation was pointed out to operators.

OPTIMUM GROWTH CONDITIONS FOR CLOSTRIDIUM BOTULINUM TYPE E

wished to examine the reliability of methods used to detect C. botulinum in foods, including direct examination for botulinum toxin, and enrichment recovery procedure for botulinum organisms and toxin, and an immunofluorescent technique for detecting botulinum organisms.

Woodburn, Margy, and Chung H. Kim (Department of Foods and Nutrition, Purdue University, Lafayette, Indiana)
Applied Microbiology 14, No. 6, 914-920 (November 1966)

Although a number of investigations on the incidence of Clostridium perfringens in raw and prepared foods have been reported, less has been done with growth-death patterns during cooking and storing foods. An understanding of the relative importance of heat penetration as related to survival of original contaminants, whether vegetative cells or spores, and recontamination of cooked products may help in evaluating the probable safety of cooking and storing procedures.

In the present work, the survival of a C. perfringens inoculum in the stuffing of baked turkey was studied along with cooking temperatures that are currently used. The authors found that when stuffed turkeys are cooked by accepted methods, C. perfringens contaminants may survive and create a hazard if subsequent storage is in a temperature range that permits their multiplication. [14 references]

[Abstracter: F. Bruce Sanford]

2.05

C. botulinum Type E antigens were prepared from washed cells by either the formalin treatment or by heating at 100° C. The antigens were used to immunize rabbits. Agglutination tests showed that both types of preparations produced high levels of antibody. Flagellar antigens were highly strain-specific and somatic antigens were sufficiently similar to produce complete cross-agglutination. One toxigenic strain of Clostridium produced toxigenic and nontoxigenic progeny that, in all respects other than toxicity, were physiologically and antigenically identical. Other nontoxigenic strains with growth, physiological, and morphological characters identical to Type E and strains with some physiological differences completely cross-agglutinated with Type E strains via the somatic antigen.

Agglutination tests with somatic antigens against somatic and H-O antisera showed high antibody titers and complete cross-agglutination. The somatic antisera were tested against somatic antigens of C. botulinum Types A, B, C, and F, and C. perfringens, C. bifermentans, C. sporogenes, and C. acetobutylicum. The somatic antigen of C. acetobutylicum was the only antigen agglutinated; it was agglutinated to a high titer by all the sera. This reaction appeared to be due to a nonspecific anamnestic response and did not appear to be related to the immunizing strains. The nontoxigenic strains studied seem to have no greater antigenic differences from Type E strains than the Type E strains had from each other. [24 references]

SURVIVAL OF CLOSTRIDIUM DURING BAKING

2.1124 WADE SEINE CONSTRUCTION AND METHOD OF USE

Floyd, Hilton M. (Bureau of Commercial Fisheries, Exploratory Fishing and Gear Research Base, Pascagoula, Mississippi)
Commercial Fisheries Review 28, No. 1, 8-11 (January 1966)

The wade seine is one of the many types of haul seines used in the fishing industry. Since the fishermen have to wade into the water with this seine, it is used mostly in warm climates. The seine described in this paper is popular along the southeastern coast of the United States, especially in northeastern Florida. The wade seine is one of the easiest seines to construct because it has no tapered netting. Actually, it is just a rectangular piece of netting with a floatline, a leadline, and a pole attached to each end for convenience in hauling. Purchasing a readymade seine usually saves valuable time; however, some commercial fishermen might save money by building this gear themselves. The present paper includes illustrations and detailed instructions for construction of a wade seine.

The object of wade seining is to surround the fish and haul them onto the beach. Commercial wade seining on the northeast Florida coast is usually carried out by two men, the inshore man (who normally directs the operation) and the wader.

The following general rules apply to most wade-seining operations:

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2.115 MODERN PRINCIPLES IN PROJECTING AND DESIGN OF VESSELS

Møller, Sverre
Norwegian Fishing and Maritime News 13, No. 2, 7-8, 10, 13, 31, 33, 35, 37 (1966)

"Operational analysis," a rational, systematic working method based on the extensive use of computers, is used to obtain information and guidance for making practical decisions about ship building. Although the method appears to be more suited to the projection and design of a merchant fleet, it has been applied to a study of trawler design and use.

The basic objective of the study was to get raw fish to a plant for processing into frozen fillets in the least expensive way possible. A working hypothesis evolved from discussions between representatives of the processing industry, trawler companies, operational analysts, and naval architects. They discovered that not only the actual catching operation but also processing and marketing affected the solution to their problem. They therefore had to widen the scope of their analysis.

After the preliminary discussions, the investigators formulated a set of more specific objectives: (1) to determine the size and shape of fishing vessels for catching the most fish in relation to the direct and indirect costs involved; (2) to determine the influence of a fish-meal plant on board the vessel; (3) to determine the most economic service speed; and (4) to indicate, on a monthly

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2.117 AMERICA STEPS UP RESEARCH

Anonymous
World Fishing 16, No. 2, 28-29 (February 1967)

The amount allotted annually to oceanographic research in the United States has risen from less than $10 million in 1957 to $310 million in 1967. During this 10-year period, the American oceanographic fleet has expanded from a few vessels to a modern fleet of 115 vessels, which has made significant contributions to charting the oceans of the world.

The newest, most modern vessel in the American fleet is the Oceanographer, which is presently engaged in a 6-month round-the-world voyage to collect gravity, magnetic, and water-depth recordings. Data will be recorded in areas of the Atlantic, Pacific, and Indian Oceans for which information is scanty. The Oceanographer is specifically designed as an oceanographic research vessel capable of conducting comprehensive deep-sea surveys. She has oceanographic laboratory space plus smaller, well-equipped laboratories for meteorological, gravity, and photographic research. She is also equipped with special gear for handling scientific instruments over the side, with a computer, with automated control and data systems, and with satellite navigation equipment.

The development of deep-diving craft represents another phase of the development of oceanographic research vessels. The underwater abilities of these

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3.15 SHELF LIFE OF RADIOPASTUERIZED FISHERY PRODUCTS
(*)

Ronsivalli, Louis J. (Bureau of Commercial Fisheries, Gloucester, Massachusetts)
Activities Report 19, No. 1, 59-63 (Spring 1967) (U.S. Army Natick Laboratories, Research and Development Associates, Inc., Natick, Massachusetts)

In subjective terms, fish is considered spoiled when organoleptic testing indicates that it is unacceptable for human consumption. Among the factors that affect spoilage of fish are initial bacterial contamination, method of processing, packaging, and the temperature at which the fish is stored. The products of bacterial activity make fish organoleptically unacceptable; in general, a fresh fish will become spoiled in about 2 weeks when stored at 33° F., at which point the total plate count is in the range of 10^6-10^7 bacteria per gram of fish. Although the fish is considered spoiled, it is not necessarily toxic at this point.

The period between capture and spoiling is known as the shelf life of the fish. The shelf life of a number of seafoods has been successfully extended two- or three-fold by the application of low doses of ionizing radiation, which apparently has a lethal effect on bacteria. Irradiation with 250 kilorads reduced the number of bacteria on haddock fillets by 2 to 3 log cycles. In addition to reducing the number of bacteria contaminating a fish, irradiation changes the nature of the microbial spectrum because some bacteria are more resistant to radiation than others are. To prevent recontamination of the fish after irradiation, it must be

*Item on back of card.

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CONSTRUCTION AND USE OF A WADE SEINE

COMPUTERS FOR VESSEL DESIGN

AMERICAN OCEANOGRAPHY VESSELS

SHELF LIFE OF IRRADIATED FISH

2.115

basis, the best fishing grounds in relation to location of the processing plant, according to the criteria established in objective 1, or those grounds that give the largest catch without regard for economy.

A model was then constructed with the help of a computer. Such information as voyages, distances, rate of catch, weather and sea conditions involved in catch statistics; economic data on the running, manning, and overhaul of vessels and equipment; as well as other considerations were analyzed with the help of the computer during construction of the model.

The investigators found definite optimum points for vessel sizes given similar considerations. Service speed was found to be relatively unimportant, but the inclusion of a fish-meal plant on board measurably reduced the cost of delivered fish. As the size of the vessel increased, monthly catch variations were reduced. From the model it was estimated that reducing time in port from 26 to 24 hours was equivalent to a 5 percent increase in catch.

It was concluded that the construction of models by operational analysis can aid in making rational decisions for ship owners and ship yards, but the method is only an aid; the solutions it offers must still be evaluated in the light of experience and the unquantifiable factors that also enter into the final decision.

2.1124

1. Schooled fish should be surrounded from a direction opposite to that of their travel.

2. If scattered fish are known to move with an existing current, and it is not too strong, the fish should be hauled against the current.

3. In instances where the seine is to be hauled a distance before it is landed--that is, if it is to be dragged over an area to accumulate scattered fish--the offshore end should be well ahead of the inshore end, and a bight of seine should always be behind the inshore end.

4. The inshore man should watch the bight for breaking or jumping fish and signal the wader when it is time to land the catch.

5. The wader should never go so deep that the net does not touch the bottom. Lack of bottom traction slows the movement of the seine and allows escapement around the offshore end.

6. While the net is being landed, the leadline should be kept as close to the bottom as possible so it will not allow the fish to swim under and escape. Also, if the fish are jumping, holding the float line up above the water surface will greatly reduce escapement.

7. Noise should always be kept to a minimum because it will scare the fish offshore. Likewise, lights shown on the water at night may frighten the fish.

3.15

stored in an adequate container. Hermetically sealed containers not only prevent recontamination but also work to change the nature of the microbial flora on the fish. The author expresses concern that the course of spoilage in radiopasteurized fish may not be the same as in nonirradiated fish. Anaerobic pathogens are known to be capable of growth in refrigerated fish products. Normally the fish will spoil before toxin can be produced. The author speculates that the extended shelf life imparted by irradiation might allow toxin to be produced before the fish showed organoleptic signs of spoilage. It is also possible that the growth of anaerobic pathogens might be facilitated by the removal of competing common spoilage bacteria by radiopasteurization. Furthermore, the product might never become really objectionable after irradiation.

Work is currently underway to determine whether or not toxin might be produced in irradiated fish before the fish appears spoiled. It is known that the absence of normal spoilage bacteria retards, rather than enhances the growth of anaerobes. Organoleptic testing is being used to investigate the safety of the radiopasteurization process. If members of the taste panel accept spoiled irradiated fish, but reject spoiled unirradiated fish, then the process can be considered dangerous. [17 references]

3.15 DEVELOPMENT OF RADIATION-STERILIZED SEAFOOD PRODUCTS.
I - ENZYME-INACTIVATED COD AND HALIBUT PATTIES

Stanbuber, R. O. (Oregon State Univ., Corvallis), and Mary L. Landers, T. C. Yu, Morris Simon, and Fred Helligman
Chemical Abstracts 66, No. 9, 36641m (February 27, 1967)

2.117

submarines were proven when one of them assisted in locating and recovering a hydrogen bomb lost off the coast of Spain in 1966. The world's first atomic-powered deep-sea vessel is now under construction. The vessel is capable of working at depths of 6,000 ft. and is intended to be used for detailed studies and mapping of the Continental Shelf for scientific and commercial purposes. Another underwater vessel, the Sealab, enables men to live and work for 45 days at a depth of 205 ft.

A firm of naval architects in Boston, Mass., has designed the first oceanographic vessel to be owned directly by the National Science Foundation. This vessel was specifically designed with Antarctic operation in mind; she will be rigged as a deep-sea trawler and stationed in waters off Antarctica. It will not be necessary to go on deck to get to any space from any other space on the ship. Five watertight and three nontight steel bulkheads will divide the hull and provide structural strength. The steadiest part of the ship will contain the laboratories, pilothouse, quarters, and winches.

The vessel is designed to carry enough sail to maneuver and remain under control in the event of a loss of power. Davits will be rigged on the port side of the main deck for handling a special launch that can be used for following whales and seals.

Special attention has been given to the handling of specimens. The deckhouse, which will extend to the rail on the port side, will enclose a refrigeration room and a room for dissecting large specimens. A trolley system will carry specimens from the deck to the dissecting room.

3.15 EFFECT OF PASTEURIZING DOSES OF GAMMA RADIATION ON STORAGE LIFE OF COOKED LOBSTER MEAT

Power, H. E., D. I. Fraser, W. J. Dyer, W. Neal, and C. H. Castell (Fisheries Research Board of Canada Halifax Laboratory, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 24, No. 2, 221-230 (February 1967)

Growth of bacteria on the surface of marine products is responsible for spoilage of the product during iced storage. For every 10-fold reduction in the number of bacteria contaminating a fillet during processing, about 1 day is added to the shelf life of the product. It is not possible to maintain aseptic conditions in a commercial fish-processing plant, but it is possible to destroy the bacteria on packaged, processed fish by subjecting the product to ionizing radiation. Because a dose of radiation large enough to ensure sterilization causes undesirable changes in the odor, appearance, and taste of fish, it would not be feasible to try to duplicate the results of aseptic handling by this means. Substerilization doses of ionizing radiation, however, extend the storage life of various marine products by substantially reducing the initial bacterial contamination. The effect of ionizing radiation on the organoleptic qualities of marine products varies with species and dose.

The present study is concerned with the effect of pasteurizing doses of gamma radiation on the organoleptic characteristics and storage life of cooked lobster meat stored at 0° C. Samples of cooked and packaged lobster meat from a commercial
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 ABSTRACTER: E. R. Weissman

3.5 STUDIES ON SALTING AND DRYING FISH.
I - EQUILIBRIUM CONSIDERATIONS IN SALTING

Del Valle, F. R., and J. T. R. Nickerson (Department of Nutrition and Food Science, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139)
Journal of Food Science 32, No. 2, 173-179 (March-April 1967)

This paper is the first in a series concerned with equilibrium considerations in the salting of fish. When muscle is immersed in brine it will either gain or lose water to or from the brine, depending upon the concentration of the brine and the temperature. Equilibrium is the condition existing when there is no tendency for water to move in either direction between the fish muscle and the brine.

Swordfish (Xiphias gladius), being considered an ideal "model system" because of its firm flesh, was used in all the studies. The following variables were studied at equilibrium between fish muscle and brine, all as functions of the salt concentration in the brine: (1) salt concentration in the muscle, based on the volume of the muscle; (2) salt concentration in the tissue water of the muscle; and (3) distribution coefficient of salt between muscle tissue water and brine. The following secondary variables that further described the salting equilibria were also studied as functions of salt concentrations in the brine, all based on unit weight of nonsalt solids in the salted muscle: weight of salt, weight of water, and total volume of the muscle.
(over)

 ABSTRACTER: M. F. Tripple

3.15 REMOVAL OF BACTERIA FROM FOOD RAW MATERIAL BY ELECTROPHORESIS II - APPLIED STUDY WITH BABY CLAMS AND OYSTERS

Tanikawa, Eiichi, Terushige Motohiro, and Minoru Akiba (Laboratory of Marine Food Technology, Faculty of Fisheries, Hokkaido University, Hakodate, Japan)
Food Technology 21, No. 3A, 121A-125A (March 30, 1967)

Raw oysters may contain enteric bacteria (Salmonella typhosus or Shigella dysenteriae) unless they are cultivated in unpolluted waters. Baby clams live in sea mud, which contains organic material, including heat-resistant bacteria; thus their intestines contain bacteria. Since these bacteria in clams eventually cause the product to spoil or discolor, some means of sanitizing these shellfish is necessary.

Both ultraviolet radiation and chlorination have been used to disinfect oysters, but the ultraviolet rays do not penetrate far enough to be effective and chlorination takes a long time and tends to leave a chlorine odor in the product. The highest temperature used in commercial processing of clams sometimes fails to destroy all the thermoresistant bacteria. The authors describe an electrophoretic method for removing bacteria from raw food materials.

Several factors affect the conditions under which electrophoresis can be applied to shellfish. The biological activity of the fish is curtailed at
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 ABSTRACTER: E. R. Weissman

3.5 (*) STUDIES ON SALTING AND DRYING FISH.
II - DYNAMIC ASPECTS OF THE SALTING OF FISH

Del Valle, R. F., and J. T. R. Nickerson (Department of Nutrition and Food Science, Massachusetts Institute of Technology, Cambridge Massachusetts 02139)
Journal of Food Science 32, No. 2, 218-224 (March-April 1967)

The dynamic aspects of the migration of sodium and chloride ions into and inside fish muscle during the salting of fish, from the aspects of diffusion and electrochemical conduction, are considered. Fresh swordfish muscle (Xiphias gladius) was used in the study.

The following aspects were studied in salted swordfish muscle: diffusion coefficients for salt transfer; equivalent conductance; transference numbers of sodium and chloride ions; diffusion coefficients for sodium chloride at infinite dilution; activation energy for limiting diffusion; and predicting diffusion coefficient of salt.

The diffusion coefficient for the penetration of salt into the muscle of swordfish was not constant and it depended upon the concentration of salt in the muscle and upon the temperature. The diffusion coefficient of salt muscle was plotted against salt concentration in the muscle for salting at 5° and at 25° C.
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*Item on back of card.

 ABSTRACTER: M. F. Tripple

RADIOPASTEURIZATION OF COOKED LOBSTER MEAT

DISINFECTING SHELLFISH BY ELECTROPHORESIS

EQUILIBRIUM ASPECTS OF FISH SALTING

DYNAMIC ASPECTS OF FISH SALTING

temperatures below 5° and above 35° C. The optimum temperature range for the electrophoretic medium is between 10° and 25° C. When sea water is used as the medium, electrolysis of the electrolytes will occur, forming mainly Cl_2. Although the amount of Cl_2 formed is not enough to affect the bacteria, the electrolysis will cause damage to the electrodes and cords of the apparatus. Thus sea water is unsuitable as an electrophoretic medium. Fresh water affects the biological activity of oysters, but not so quickly that the electrophoresis cannot be carried out.

The application of 5 to 15 volts for 40 min. is sufficient to remove all the Escherichia coli cells from the intestines of oysters having an initial contamination of less than 1,000 cells per gram. Only E. coli were studied because their mobility is almost the same as that of S. typhosa and Sh. dysenteriae. More heavily contaminated oysters will retain 0.1-0.2 percent of the initial contamination after similar treatment. The authors note that either the period of application or the intensity of the electric field has to be increased if all bacteria are to be removed.

SG-2 bacteria were found to cause the blackening and swelling of canned baby clams. In clams with a low level of initial contamination, electrophoresis effectively removed the bacteria. Clams with a high level of initial contamination were disinfected either by several changes in the electrophoretic medium or by the addition of a surface-active agent to the medium. However, the time necessary for removal of all bacteria by means of water changes is too long for practical application.

processing plant were split into five groups. One group of samples was frozen and stored at -26° C. for use as an unirradiated frozen control; a second group was packed in ice to serve as an unirradiated iced control. Three groups were irradiated with 75,000, 150,000, and 250,000 rads, respectively, and then stored in ice.

The initial plate count for the unirradiated iced control sample was 6,900 bacteria per gram of meat. Irradiation with 75,000 rads reduced the initial plate count to 120 bacteria per gram, and irradiation with 150,000 rads and 250,000 rads reduced the plate counts for the other two groups to less than 100 bacteria per gram. The plate count for the unirradiated iced sample reached 129,000 bacteria per gram after 7 days' storage in ice. At the same time, the count for all irradiated samples was less than 100. After 21 days' storage, the count on the unirradiated iced sample reached 510×10^6 bacteria per gram. For the samples irradiated with 75,000, 150,000, and 250,000 rads, the counts were 90×10^6, 3.3×10^6, and 2.1×10^6 bacteria per gram, respectively; after 35 days the counts were $1,000 \times 10^6$, 600×10^6, and 66×10^6, respectively. Bacterial counts for the frozen control samples ranged between 2,100 and 8,700 per gram during the course of the experiment.

The results of organoleptic assessment, bacterial counts, and measurement of trimethylamine values indicated that 75,000 rads was the optimum dose for pasteurizing cooked lobster meat. At this dose, the shelf life of lobster meat stored in ice was extended about 14 days. The higher doses used in this study were found to reduce the organoleptic qualities of the meat noticeably. [16 references]

The resulting curve for 25° C. had a minimum value at a salt concentration of about 1.5 moles per liter and was always lower in fish muscle than in aqueous salt solutions of the same salt concentration as the muscle. Other parameters that also served to characterize the migration of salt in fish muscle were determined as follows: (1) the equivalent conductance of salted fish muscle was found to be an inverse linear function of the square root of the salt concentration in the muscle and was always found to be lower in muscle than in aqueous solutions of the same concentrations as the muscle; (2) the sodium and chloride ion transference numbers, which were found to be about the same magnitude in muscle and in water, showed the same qualitative variation with salt concentration and with temperature in both media.

As in the aqueous solution, the diffusion coefficient and the equivalent conductance of salt in fish muscle were found to increase as the temperature increased. Experimental values of the diffusion coefficient at a given temperature agreed reasonably well with the values predicted by the equation $\overline{D} = \overline{D}_o\ (1 + d \ln \overline{y}/d \ln \overline{c})$ where $\overline{D}_o$ is the diffusion coefficient in the muscle at infinite dilution, d is the thickness of the slice of fish muscle, and y is the mean molar activity coefficient of salt in the muscle at concentration c. The activation energies of salt diffusion in fish muscle and in water at infinite dilution were both found to be in the order of 4,700 calories per gram-mole, a value that is within the region of hydrogen-bonding energies. [12 references]

Naseđkina, E. A.
Chemical Abstracts 66, No. 17, 75069a (April 24, 1967)

3.5 CHANGES IN MEAT COMPOSITION OF THE PACIFIC SALMON DURING SALTING AND AGING

3.5 CHANGES IN MEAT COMPOSITION OF THE PACIFIC SALMON DURING SALTING AND AGING

The salt concentration based on muscle volume was found to continually increase with increasing brine concentration. The same was true for salt concentration in the tissue water and the salt content expressed as weight of salt in salted muscle per weight of nonsalt solids in the muscle. The distribution coefficient based on the volume of the muscle and on the water and volume contents was found to increase initially, pass through a maximum, and then decrease with increasing brine concentration. The salt concentration in the tissue water was found to equal the salt concentration in the brine so that the distribution coefficient calculated on this basis was always equal to unity and was independent of the salt concentration of the brine.

The volume per unit weight of nonsalt solids was found to be a direct linear function of the water content per weight of nonsalt solids at all temperatures studied. Little difference was found between the equilibrium salting variables when salting was done at either 5° or 25° C. On the other hand, all variables were considerably lower when salting was done at 37° C., possibly due to heat denaturation of the muscle with subsequent loss of water at this temperature. The "mean molar activity coefficient" of sodium chloride in fish muscle was determined as a function of salt concentration in muscle. The activity was found to be always greater and to vary more sharply with salt concentration than was the corresponding activity coefficient of salt in aqueous solution. [20 references]

4.11 (*)

THE BEHAVIOR OF GLYCERIDE-FATTY ACID MIXTURES IN BILE SALT SOLUTION: STUDIES BY GEL FILTRATION

Feldman, Elaine Bossak, and Bengt Borgström (Department of Physiological Chemistry, University of Lund, Lund, Sweden)
Lipids 1, No. 6, 430-438 (November 1966)

Lipid emulsions of bile salts can be prepared to simulate the fat content of the small intestine during digestion. Volumes of elution obtained after gel filtration of emulsions of glycerides, fatty acid, and bile salt will provide data concerning micellar dimensions. Gel filtration of samples incorporating radioactive lipid solutes will allow determination of the distribution of labeled solutes into eluents containing particles of different sizes.

Lipid emulsions of bile salt were prepared to simulate the emulsified oil-micellar phase system of the small intestinal content during fat digestion. The lipid emulsions of bile salt were applied to gel columns that were prepared and eluted with 6 mM sodium taurodeoxycholate. The following situations were investigated:

1. Lipids were incorporated into micellar solutions with varying solute concentrations and composition. The dimensions of the resultant micelles of bile salt lipid were characterized. The dimensions of the micelles were larger as the lipid concentrations were increased. Inclusions of multiple lipid classes resulted in larger micellar particles.

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ABSTRACTER: M. F. Tripple

4.12

FATTY ACID COMPOSITION OF THE DECAPOD SHRIMP, PANDALUS BOREALIS, IN RELATION TO THAT OF THE EUPHAUSID, MEGANYCTIPHANES NORVEGICA

Ackman, R. G., and C. A. Eaton (Fisheries Research Board of Canada Halifax Laboratory, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 24, No. 2, 467-471 (February 1967)

A zooplanktonic crustacean, Meganyctiphanes norvegica (M. Sars), from Nova Scotian waters was found to have a composition characterized by high proportions of monounsaturated fatty acids, particularly 20:1 and 22:1. The values reported for M. norvegica were different from previously reported fatty acid analyses of zooplankton. Since most data on zooplanktonic crustaceans came from the North Pacific, the authors thought it desirable to compare the fatty acid compositions of M. norvegica and the commercially important shrimp, Pandalus borealis, which had also been found in Nova Scotian waters.

Generally high levels of nonsaponifiable material and high iodine values characterize the lipids of North Pacific zooplanktonic crustacea. The high iodine values suggest that these crustacea are almost devoid of 20:1 and 22:1. Analyses of zooplanktonic samples from the North Atlantic also show a very low 20:1 and 22:1 content, suggesting that this is generally the case with zooplanktonic crustacea. The corresponding values for M. norvegica were very different from those generally observed.

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ABSTRACTER: E. R. Weissman

4.14

FATTY ACIDS IN PHOSPHOLIPIDS ISOLATED FROM HUMAN RED CELLS

Williams, J. H., M. Kuchmak, and R. F. Witter (Lipid Standardization Laboratory, Heart Disease Control Unit, Laboratory Branch, Communicable Disease Center, Atlanta, Georgia)
Lipids 1, No. 6, 391-398 (November 1966)

Object.--The main object of this study was the complete chromatographic separation of phospholipid classes in red cells by column fractionation and refractionation of overlapping components until the isolated preparations were free of contaminants. No contamination was found by thin-layer chromatography and infrared spectrophotometry, so then the fatty acids were determined by gas-liquid chromatography. Other objectives of this study were (1) to describe the fatty acids of the plasmologens separately from the fatty acids of plasmalogen-free glycerophosphatides and (2) to compare the positional distribution of fatty acids in highly unsaturated phosphatidyl ethanolamine, which was free of plasmalogen, with the positional distribution of fatty acids in plasmalogen-free lecithin in which saturated and unsaturated acids were present in about equal proportions.

Methods.--Total lipids of packed erythrocytes from healthy men were extracted with a chloroform-methanol mixture. A silicic acid column was used to separate phospholipid classes from neutral lipids and pigment. An aluminum oxide column was used to separate phosphatidyl inositol from its contaminants phosphatidyl ethanolamine and phosphatidyl serine. Additional silicic acid columns with

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ABSTRACTER: M. M. Gwin

4.19

WAX ESTERS OF MULLET (MUGIL CEPHALUS) ROE OIL

Iyengar, Ramanuja, and Hermann Schlenk
Biochemistry 6, No. 2, 396-402 (February 1967)

In a recent study of mullet (Mugil cephalus) oil, Sen and Schlenk (1964) found that the fatty acids contained 15 to 30 percent straight-chain odd-numbered components. The oil samples studied consisted mainly of triglycerides. An investigation of the distribution of odd-numbered fatty acids revealed that wax esters represented the major portion of lipids in fish roe. The structure of fatty-alcohol and -acid components of the waxes is reported and their possible biological correlation is discussed.

Lipids of mullet roe were analyzed by liquid and gas chromatography. Nearly 70 percent of the oil consisted of wax esters in which the saturated and monosaturated fatty alcohols were bound to fatty acids with up to six double bonds. The alcohols and acids from the wax esters were identified and quantified.

The wax esters of mullet possess three unique features: (1) their occurrence is limited to the roe; (2) they have a higher content of polyunsaturated acids than previously reported for marine waxes, although they contain only saturated and monosaturated alcohols; and (3) they have odd-numbered components at an unusually high percentage in alcohols as well as in acids.

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ABSTRACTER: M. F. Tripple

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Shrimp taken late in August were divided into two lots. One contained only berried females; the other contained no berried females. In general, the fatty acid analyses of the two groups of shrimp agreed. The group containing only berried females had a slightly lower level of 20:1 and 22:1 and a slightly higher level of 20:5ω3. The authors thought these differences might be associated with the roe lipids. It is known that the roe of a number of marine animals contain little of 20:1 and 22:1 and a relatively large amount of 22:5ω3.

The shrimp under examination here were somewhere between M. norvegica and other zooplankton in lipid properties and fatty acid composition. The lipids from the shrimp were found to be similar to those found in lobster (Homarus americanus). In the shrimp, 4.8 and 3.8 percent of the total fatty acid content was 20:1; 4.9 and 4.3 percent was 22:1. In M. norvegica, the corresponding values were 10.5 and 13.1 percent.

The phospholipids and triglycerides in marine animals usually have different fatty acid compositions, especially in 20:1 and 22:1. Therefore, the proportions of type of lipid of different organisms not feeding directly on phytoplankton are reflected in their overall fatty acid compositions. Brockerhoff et al. (1964) found that triglycerides, comprising 8 percent of the total lipid content of mixed zooplankton from Nova Scotian waters, had modest levels of 20:1 and 22:1, whereas the phospholipids, making up 54 percent of the lipid content, contained only trace amounts of these fatty acids. [16 references]

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Both the alcohols and the acids contained appreciable amounts of odd-numbered straight-chain compounds. The structures of monoenoic alcohols were the same as those of monoenoic acids, such as 9-heptadecenoic, 9- and 11-octadecenoic, and nonadecenoic. The total content of odd-numbered alcohols was between 10 and 25 percent; the total content of odd-numbered acids was consistently slightly lower. Several polyunsaturated acids, such as 4,7,10,13,16-heneicosapentaenoic or 4,7,10,13,16,19-docosahexanoic and related acids, were identified from the mullet for the first time. These polyunsaturated acids occurred in higher percentages in wax esters than in triglycerides of roe of body oil.

The fatty acids in wax esters of mullet were more typical for marine oils than were the fatty acids in other wax esters from marine sources that have been reported. The extensive combination of polyunsaturated acids with saturated or monounsaturated alcohols strongly emphasized the limitation of unsaturation in the latter acids. Because acids are the most likely precursor for these saturated or monounsaturated alcohols, biological reduction apparently cannot occur with polyenoic acids. Gas-liquid partition chromatography of hydrogenated wax esters showed that the alcohols and acids combined to form C-30 to C-40 esters, with maximum amounts for C-32 and C-34. The combination of chain lengths was random with a sample that contained about 10 percent each of C-14 and C-15 alcohol; the combination was not random when each of these alcohols occurred at the 20-percent level. [24 references]

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2. Lipids were incorporated in quantities exceeding the amount that could undergo micellar dispersion. Excess monoglyceride yielded a liquid crystalline phase and excess diolein was emulsified. All of these phases were in equilibrium with a micellar phase.

3. Lipids were dispersed in a buffer without bile salt and yielded an emulsion.

4. Lipids were incorporated in bile salt-triglyceride emulsions and yielded an emulsified oil phase in equilibrium with a micellar phase. The relative distribution of the lipid solutes into the two phases was measured.

Under the conditions used, the monoglyceride and fatty acids were completely eluted in the micellar phase. Minimal amounts of triolein were recovered in the micellar solution. Extraction, chromatographic separation, and quantitative analysis confirmed the presence of minimal amounts of triolein. When the concentration of diolein was increased, less diolein was recovered in the micellar phase. The addition of triglyceride enhanced the distribution of diolein in the emulsion phase. [21 references]

4.11 MONOGLYCERIDES OF FATTY ACIDS

U.S.S.R. Patent 186,429
Chemical Abstracts 66, No. 18, 77246e (May 1, 1967)

4.14

modified solvent systems were used for complete separation of additional overlapped phospholipid classes. The phospholipids in each eluted fraction were identified by thin-layer chromatography, using the appropriate spray tests and reference compounds, and identification was confirmed on each of the isolated phospholipids by infrared spectrophotometry.

Results.--The total content of phospholipids as determined by phosphorus analysis was 2.63 milligrams per milliliter of packed red blood cells. The phospholipids had the following composition, in percent of total phospholipid: phosphatidyl inositol, 2.3; phosphatidyl ethanolamine, 13.4; ethanolamine plasmalogen, 14.5; phosphatidyl serine, 3.9; lecithin, 34.2; choline plasmalogen, 1.4; sphingomyelin, 28.4; and lysolecithin, 1.7. Gas-liquid chromatography was used to determine the fatty acid composition of each phospholipid. The average number of double bonds per fatty acid in the isolated phospholipids were as follows: phosphatidyl inositol, 1.5; phosphatidyl ethanolamine, 1.9; ethanolamine plasmalogen, 3.6; phosphatidyl serine, 2.1; lecithin, 1.0; choline plasmalogen, 2.0; sphingomyelin, 0.2; and lysolecithin, 0.5. The positional distribution of fatty acids in both lecithin and phosphatidyl ethanolamine was determined by selective enzymatic hydrolysis with phospholipase A. Saturated fatty acids of lecithin were esterified predominantly in the α′-position. Only 63.9 mole percent of the saturated fatty acids in phosphatidyl ethanolamine were found in the same position. [33 references]

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CHEMICAL REACTIONS INVOLVED IN THE DEEP FAT FRYING OF FOODS. II - IDENTIFICATION OF ACIDIC VOLATILE DECOMPOSITION PRODUCTS OF CORN OIL

Kawada, Tsukasa, R. G. Krishnamurthy, B. D. Mookherjee, and S. S. Chang (Department of Food Science, Rutgers, The State University, New Brunswick, New Jersey)
Journal of the American Oil Chemists' Society 44, No. 2, 131-135 (February 1967)

Systematic chemical identification of the acidic volatile decomposition products (VDP) that are produced by commercial deep-fat frying of corn oil is important for the following reasons: (1) clarification of the mechanisms of thermal oxidation; (2) the study of the effects of VDP upon human nutrition; and (3) the contribution of VDP to the deep-fat fried flavor of foods. In this experiment corn oil was maintained at 185° C. for 30 hr. with periodic frying of moist cotton balls and with addition of fresh oil to replenish the oil lost due to evaporation, decomposition, and adsorption by the cotton balls. The acidic volatile decomposition products produced by the corn oil were fractionated by repeated gas chromatography and the gas chromatographic fractions were identified by infrared and mass spectrometry. Thirty acids were characterized by these methods. The acids consisted of twelve n-aliphatic saturated acids, seven 2-enoic acids, one 3-enoic acid, three keto acids, two hydroxy acids, four dicarboxylic acids, and one aromatic acid. The authors suggest that the effects of some these acids on human nutrition be studied. [17 references]

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 ABSTRACTER: M. M. Gwin

6.190
(*)

NET PROTEIN UTILIZATION OF FISH PRODUCTS

Olley, June, and P. R. Payne
Fishing News International 6, No. 1, 34-35 (January 1967)

Biological tests, which indicate the content of available sulfur-bearing amino acids, may be used for assessing the value of fish products for use in animal feeds. However, the authors point to the need for a simple, routine procedure for measuring the quality of animal protein concentrates. Tests for net protein utilization (NPU), biological value (BV), and protein efficiency ratio (PER) are all used to assess protein quality in animal feeds, but these tests are dependent upon animal feeding trials. In the present paper, the results of an in vitro pepsin digest procedure for measuring protein quality in animal feed are compared with results of NPU tests.

Processing may reduce the nutritive value of feed either by reducing digestibility of the food by blocking enzymic hydrolysis, or by reducing the biological value of absorbed amino acids. The latter reduction may be the result of chemical changes in the amino-acid molecules or a change in the relative rates of adsorption of essential amino acids. It has been shown that reduction of biological value is the most important cause of loss of nutritive value. The authors believe that high concentrations of pepsin and long digestion periods have led

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 ABSTRACTER: E. R. Weissman

4.92

NUTRITIONAL ASPECTS OF THERMALLY OXIDIZED FATS AND OILS

Kaunitz, Hans
Food Technology 21, No. 279, 60-62, 64 (March 1967)

The organoleptic changes in fats and oils caused by heat damage have been recognized since prehistoric times; however, only in the last 20 years has research been done on the nutritional effects of fats and oils damaged by heat. Previously, researchers thought that the major nutritional effects of eating damaged fats came from destruction of vitamins in the diet. Since then, however, they have considered other conditions, such as possible toxic factors in rancid fats.

Kaunitz et al. (1956) found that the volatile cleavage products of highly oxidized lard were toxic to rats. Such products may occur in the intestines after the breakdown of peroxides. The author suggests that more work with purified compounds is necessary to clarify this point. One conclusion that may be drawn from the work of Kaunitz is that peroxides are not generally toxic, because lard became more toxic as its peroxides were destroyed by heating. On the other hand, Matsuo (1954) found that the toxicity of some fish oils had a positive correlation with their peroxide content. The author suggests that the source of a lipid peroxide may have a bearing on its toxicity.

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 ABSTRACTER: E. R. Weissman

6.191

THE DIGESTION OF HEAT-DAMAGED PROTEIN

Nesheim, M. C., and K. J. Carpenter (School of Agriculture, University of Cambridge, England)
British Journal of Nutrition 21, No. 2, 399-411 (1967)

The biological value of proteins may be reduced by heat damage to a greater extent than can be explained either by changes in amino-acid composition of acid hydrolyzates made from these materials or by changes in the overall digestibility of the materials.

Results obtained with rats indicate that heated cod is still fairly well digested; however, it seemed essential to confirm this fact with chicks, which are the animals used for growth assays. Digestibility determinations were first made by indirect estimations with intact chicks and then, because of discrepancies depending on which of the common assumptions was used to estimate the partition of urinary and fecal nitrogen, the work was repeated with chicks that had been operated on to allow separate collections of urine and feces. Measurements were made of the net changes in intestinal nitrogen after the ingestion of control and damaged protein. The effect of cecectomy on fecal nitrogen levels was measured to give an indication of possible differences in the rate of intestinal absorption and in the significance of cecal fermentation for the two materials. An unsuccessful attempt was made to obtain direct values with the chick for the availability of isoleucine, chosen as an example of an amino acid with a paraffin side-chain.

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 ABSTRACTER: M. F. Tripple

ACIDIC VOLATILE DECOMPOSITION PRODUCTS OF CORN OIL

NUTRITIONAL ASPECTS OF OXIDIZED FATS AND OILS

PREDICTION OF NET PROTEIN UTILIZATION

DIGESTION OF HEAT-DAMAGED PROTEIN

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Other products of heat damage to oils have been shown to be nutritionally undesirable. One result of these discoveries has been that fish oils are no longer polymerized for human consumption. Yet, other studies have shown that polymerized fish oils may not be as toxic as other polymerized fats. One study involving rats indicated that polymerized fish oils might be useful in the treatment of obesity.

Other aspects of the ingestion of damaged fats that have been considered are the way in which they are absorbed into the body and their effects on body tissues, chemical changes in body composition resulting from ingestion of damaged fats, morphological changes, and the possibility that an animal becomes more susceptible to certain diseases as a result of ingesting damaged fats.

The author notes that many of these studies of the nutritional effects of damaged fats were conducted on animals, and fats were used that were much more damaged than are ever used for human consumption. When the results were extrapolated to humans, an erroneously bleak picture was formed of the effects of eating oxidized fatty materials. Studies with mildly treated fats, which were treated in ways comparable with the normal treatment given fats for human consumption, have indicated little effect on test animals. The author believes that many of the imagined dangers of eating oxidized fats of a few years ago can now be discounted. [59 references]

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Heat-damaged cod flour and freeze-dried cod muscle as a control were fed to the chicks that had undergone cecectomy to allow separate collection of urine and feces. The apparent digestibilities for chicks were 77 percent for the heat-damaged cod flour and 90 percent for the control cod muscle. These differences are similar to the values found for rats in an earlier work, but they were considerably smaller than the differences found in the nutritional value of the cod flour and muscle as sources of either lysine or methionine for chicks.

The chicks sacrificed 3 hours after a meal of heat-damaged cod flour showed little more nitrogen in their small intestines than did chicks fed a nitrogen-free diet. Other chicks that received the heat-damaged flour showed much more nitrogen remaining in the gut.

The authors hypothesize that significant quantities of heat-damaged protein may remain undigested in the small intestine and may then be deaminated by fermentation in the cecum so that the values for the digestibility of nitrogen and individual amino acids may be misleadingly high. This hypothesis is supported by the finding that in cecectomized birds the apparent digestibility of the nitrogen of heat-damaged cod flour was only 68 percent, whereas the digestibility of the control cod remained the same as in the intact chicks. [29 references]

4.4 CHEMICAL REACTIONS INVOLVED IN THE DEEP FAT FRYING OF FOODS. III - IDENTIFICATION OF CORN OIL DECOMPOSITION PRODUCTS

Krishnamurthy, R. G., and Stephen S. Chang (Department of Food Science, Rutgers, The State University, New Brunswick, New Jersey)
Journal of the American Oil Chemists' Society 44, No. 2, 136-140 (February 1967)

The nonacidic volatile decomposition products (VDP) produced by commercial deep-fat frying of corn oil were characterized. A total of 45 compounds was positively identified and 20 compounds were tentatively identified as constituting the nonacidic VDP of corn oil. The 65 total compounds consisted of 11 hydrocarbons, 7 alcohols, 2 esters, 6 lactones, 21 aldehydes, 9 ketones, and 9 aromatic compounds. Including the 30 acid compounds identified in Part II of this experiment, a total of 95 compounds has been determined as volatile decomposition products of corn oil.

Some of the chemical reactions involved in the deep-fat frying of foods were revealed by the chemical structure of the identified compounds and the postulated mechanisms of their formation. Many of the identified compounds showed interesting odor characteristics. The authors again concluded that investigation is needed on the effect of these compounds on human health, and particularly on the effect of these compounds when inhaled or ingested. [18 references]

6.190

to poor correlation between the results of in vitro digestibility tests and animal feeding tests.

An acid medium containing 0.0002 percent pepsin was used in this study. The percentage (D) of the nitrogen in the test materials that were rendered soluble in an acid medium containing pepsin and the percentage that were rendered soluble in an acid medium without pepsin (S) were used to calculate the corrected pepsin digestibility (d). The formula used was $d = \frac{100\ (D-S)}{100-S}$ percent. The pepsin digestibility correlated well enough with NPU measured at a level of 10 percent crude protein in the test diets to suggest that NPU may be predicted by the measurement of pepsin digestibility.

The possibility that a correlation may be found between the amount of acid-soluble material in the test material, and the nutritive value of the test material was also investigated. The various products tested ranged from 13 to 77 percent soluble in dilute acid, but the rate of digestion by pepsin of the remaining 23 to 87 percent correlated with NPU. These data indicate that the NPU of the acid-soluble material and that of the insoluble material must have been about equal, and that it is the measure of the rate at which pepsin attacks the acid-resistant part of the materials that is related to the nutritional value of the whole.

Miwa, Katsutoshi
Chemical Abstracts 62, 9700h (April 12, 1965)

6.190 QUALITY OF FISH MEAL AS A FEED

6.32 (*)

PROTEINS IN THE CELL WALLS OF SOME GREEN ALGAE

Thompson, E. W., and R. D. Preston (Astbury Department of Biophysics, University of Leeds, England)
Nature 213, No. 5077, 684-685 (February 18, 1967)

Researchers have recently confirmed the presence of protein in cell walls of plants. When a cell was fractionated, protein containing hydroxyproline separated with the cell wall fraction and was firmly bound to the cell wall. The authors examined a number of algae to determine (a) whether a protein containing hydroxyproline occurs in lower plants such as algae; (b) whether the protein is associated with the cell wall; and (c) whether the protein is of the type that is involved in extensibility of the cell wall. The plants examined in the experiment were the fresh-water green alga Nitella opaca, the green seaweeds Cladophora and Chaetomorpha, and Codium, a green seaweed with mannan walls. Four methods of analysis were used to prepare cell wall fractions.

With the exception of hydrolyzates of Nitella, 4-hydroxyproline was found in all wall hydrolyzates. From this information the authors concluded that a protein with characteristics resembling that found in higher plants does occur in some algae. Cladophora and Chaetomorpha contained less hydroxyproline, and Codium contained more hydroxyproline than that reported for many of the higher plants. Hydroxyproline formed the most abundant amino acid in the protein of Codium. Of more significance is that all cell-wall fractions showed a peak in the position of cysteic acid and that this peak was most prominent with Nitella wall fractions in

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ABSTRACTER: M. M. Gwin

7.591

FISH-MUSCLE PURINE AND PYRIMIDINE NUCLEOSIDE PHOSPHORYLASES

Tarr, H. L. A., and Joan E. Roy (Fisheries Research Board of Canada, Vancouver Laboratory, Vancouver, British Columbia)
Canadian Journal of Biochemistry 45, No. 3, 409-419 (March 1967)

Purine and pyrimidine nucleoside (deoxynucleoside) phosphorylases (purine or pyrimidine nucleoside:orthophosphate ribosyl- or deoxyribosyl-transferase) have been prepared from vertebrate tissues, tumor cells, and microorganisms. The preparation, slight purification, and properties of a fish-muscle purine nucleoside phosphorylase have been described. The presence of both purine and pyrimidine nucleoside phosphorylase activity in salmon livers and testes has also been described. The further purification of fish muscle purine nucleoside phosphorylase and the presence of a much weaker pyrimidine nucleoside phosphorylase in the same tissue are described.

Specificity of nucleoside phosphorylases toward purines or pyrimidines serves to distinguish two different classes; however, a clear-cut separation of these two general activities has not been obtained in all cases. Fish-muscle purine nucleoside phosphorylase has an absolute specificity for α-ribose 1-phosphate (R1-P) or α-deoxyribose 1-phosphate (dR1-P) and the β-esters are completely inactive. It is probable that most of the purine nucleoside phosphorylases can utilize both R1-P and dR1-P.

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ABSTRACTER: M. F. Tripple

6.54 (*)

NUTRITIVE VALUE OF SHRIMP FLOUR

Burkholder, Paul R., Lillian M. Burkholder, and Pedro Centeno (Lamont Geological Observatory, Columbia University, Palisades, New York)
Nature 211, No. 5051, 860-861 (August 20, 1966)

The chemical composition and possible uses of the shrimp Artemesia longinaris Bate from the South Atlantic Ocean are discussed. This shrimp species inhabits shallow waters from Southern Brazil to Argentina; it feeds on plankton and enters the commercial catch off Mar del Plata, Argentina. Shrimp averaging 2.73 grams were used in this study. The meat and shells were separated, frozen and dried in a vacuum-drying oven, and ground into a fine meal. The shrimp meal had a rich flavor and pleasing color and smell. These properties might help make it acceptable for protein enrichment of other foodstuffs. In the Philippine Islands, powdered shrimp shells are mixed with flour and eggs and fried to make a crisp delicacy.

The dry matter of the whole shrimp was about 32 percent of the wet weight. The chitinous shells, heads, and other attached matter amounted to 14 percent of the original wet weight. Dry meat amounted to 18 percent of the original wet weight of the shrimp. The calculated protein of the whole dried shrimp was 65.5 percent, or 21 percent of the wet weight. This concentration of protein is comparable with that of lean beef, ox liver, salmon, and turkey.

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ABSTRACTER: E. R. Weissman

7.591 (*)

SOME PROPERTIES OF THE PRODUCTS OF REACTION OF TADPOLE COLLAGENASE WITH COLLAGEN

Sakai, Takahiro, and Jerome Gross
Biochemistry 6, No. 2, 518-528 (February 1967)

Tadpole collagenase acted on mammalian and tadpole collagens to produce cleavage products that were isolated and separated by ammonium sulfate fractionation. The cleavage products were then analyzed for amino-acid composition, size, shape, molecular weight, conformation, and stability.

Determinations of molecular weight by sedimentation equilibrium ultracentrifugation closely agreed with earlier observations that the two fragments produced by enzyme action represent three-quarters and one-quarter of the collagen molecule. The average molecular weights for the small fragment (TC^B), the larger fragment (TC^A), and the intact molecule (TC) were 70,000, 202,000, and 298,000, respectively. Viscosity measurements were used to calculate the molecular length and rigidity; and the results were consistent with a rigid rod structure for one and two fragments, and for one-quarter and three-quarters of the intact molecule. Optical rotatory dispersion measurements indicated that the helical content was preserved in the fragments. Thermal denaturation of the fragments occurred more readily than denaturation of the collagen; at the pH of acid, thermal denaturation occurred at 32° and 29° for TC^A and TC^B, respectively, as compared to 36° for TC of calf skin. Tadpole collagen at the pH of acid

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ABSTRACTER: M. F. Tripple

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The amino-acid composition of the shrimp meat and shells was determined by acid hydrolysis and column chromatography. The glycine and valine content were higher in the shells than in the meat, whereas the meat had a higher content of cystine, histidine, methionine, and tryptophan. The amino-acid profile of A. longinaris Bate was found to be similar to that of the common canned shrimp sold in the United States.

6.54 FISH PROTEIN CONCENTRATE REGULATIONS

Anonymous
Food Trade Rev. 37, No. 4, 69 (1967) (London, England)
RFC Food Science Abstracts 1, No. 7, Abstract 67/874, p. 321 (July 1967)

FDA approval of fish protein concentrate as a food additive is contingent upon foods' containing this additive being so marked on the label.

6.32

which hydroxyproline was absent. The presence of protein in sporulated plants of Chaetomorpha and the similar amino-acid composition of the proteins from these plants and from all the other wall fractions examined are considered by the authors to indicate that the protein involved is a wall-bound protein as is claimed for higher plants.

6.32 FATTY ACIDS IN ELEVEN SPECIES OF BLUE-GREEN ALGAE: GEOCHEMICAL SIGNIFICANCE

McGinnety, J. A., Robert J. Doedens, and James A. Ibers (Department of Chemistry, Northwestern University, Evanston, Illinois 60201)
Science 155, No. 3763, 707-708 (February 10, 1967)

The total lipids of 11 species of blue-green algae were analyzed, and a simple yet qualitatively variable fatty acid composition was found. The species can be placed in three categories on the basis of their oleic, linoleic, and linolenic acid content. The absence of branched-chain acids in algae was noted, although such acids are the major components of marine bacteria. In one of the algae species, the 10-carbon acid accounted for half of the total fatty acid.

[13 references] [Abstracter: N. M. Gwin]

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underwent denaturation at 23.2°, 24.5°, and 29°, respectively for TC^B, TC^A, and TC; at neutral pH, the temperatures of denaturation were 1°-2° higher. The TC^B and TC^A differed significantly from each other in the content of 15 of the amino acids, and only glycine, glutamic acid, and aspartic acid showed less than a 10 percent difference. The total percentage of imino acids was higher in TC^B than in either TC^A or TC; however, the temperature of denaturation was lower in TC^B.

Other points that are characteristic of the fragments as compared to native collagen were increased solubility at a neutral pH and greater susceptibility to degradation by trypsin. Based on these findings, a hypothesis is proposed for the mechanism of physiologic resorption of collagen.

7.591 PURIFICATION OF 5'-NUCLEOTIDASE FROM HUMAN LIVER

Song, C. S., and Oscar Bodansky (Division of Biochemistry, Sloan-Kettering Institute for Cancer Research, New York, N.Y. 10021)
Biochemical Journal 101, 5C-6C (October 1966)

Studies of 5'-nucleotidase in the human liver have been seriously limited because of the presence of nonspecific phosphatase whose activity in the liver is similar to that of 5'-nucleotidase. This paper reports on a method for the purification of 5'-nucleotidase from human liver that results in almost complete elimination of nonspecific phosphatase activities. [9 references.]

[Abstracter: M. F. Tripple]

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The enzyme from bone marrow uses only guanine; a highly purified enzyme from a tumor cell uses guanine and hypoxathine; and the fish-muscle enzyme studied uses eight different substituted purines. The pyrimidine nucleoside phosphorylase from Escherichia coli has an absolute specificity for α-dR1-P, and it uses thymine, uracil, and several halogen- and thiol-substituted pyrimidines. E. coli also contains a comparatively specific uridine phosphorylase. Tumor cells may possess distinct uridine and deoxyuridine phosphorylases.

The slightly purified pyrimidine nucleoside phosphorylase from fish muscle uses both uridine and thymidine and the reactions are reversible. Deoxyuridine is only used weakly and cytidine and deoxycytidine are not substrates. It is not known whether different enzymes are involved with thymidine and uridine.

No inhibition of fish-muscle purine nucleoside phosphorylase by caffein, or by substituted purines, which are either feebly utilized or not utilized by the enzyme, is seen.

The finding that three distinct purine nucleoside phosphorylase fractions are present in ling cod muscle is the first demonstration of isozymes of this type of enzyme. In the few properties examined, the present nucleoside phosphorylases are similar to enzymes isolated from other sources. The equilibrium of the reactions is about 80 percent in favor of nucleoside biosynthesis, and the pH optima are about 7.0. The purified or partially purified enzymes have an absolute requirement for a reducing agent, such as 2-mercaptoethanol, to ensure stability. An absolute requirement for mercaptoethanol is found for a highly purified tumor purine nucleoside phosphorylase.

7.591 APPLICATION OF AN AUTOMATED PROCEDURE TO THE MILK PHOSPHATASE TEST

Reynolds, R. G., and W. J. P. Telford (Ontario Department of Health, Public Health Laboratory, Toronto, Canada)
Journal of Milk and Food Technology 30, No. 1, 21-25 (January 1967)

Tests for faulty pasteurization of milk, or its contamination with raw milk, are based on detection of the enzyme phosphatase in the milk. The official test for phosphatase in pasteurized milk in the United Kingdom relies on incubation of the milk for 2 hours using p-nitrophenyl disodium orthophosphate as the substrate. American scientists used a substrate of disodium phenyl phosphate, an improved buffer system, separation of undesirable milk constituents by dialysis, and extraction with butyl alcohol to reduce the incubation time to 1 hr. and attain excellent sensitivity.

The present article describes a technique reported by Morganstern et al. (1965) for the automated determination of alkaline phosphatase in blood serum and the adaptation of this technique to the detection of phosphatase in milk. A commercially available, automated analyzer is used with p-nitrophenylphosphate as the substrate, a 2-amino-2-methyl-1-propanol buffer, and dialysis of the post-incubation stream. Some of the advantages of this method are rapid and sensitive analysis of multiple untreated milk samples; separate determination of phenol or phosphate is not required because the substrate produces its own chromogen; and control analyses are not necessary.

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 ABSTRACTER: E. R. Weissman

7.80 EVALUATION OF OBJECTIVE METHODS OF MEASURING DIFFERENCES IN TEXTURE OF FREEZE-DRIED CHICKEN MEAT

Bele, Linda May, Helen H. Palmer, Alvin A. Klose, and Theodore F. Irmiter (Western Regional Research Laboratory, Agricultural Research Service, U.S. Department of Agriculture, Albany, California 94710)
Journal of Food Science 31, No. 5, 791-800 (September-October 1966)

The purpose of this investigation was to determine whether sensory methods could be replaced by objective methods for the measurement of texture, tenderness, and juiciness of freeze-dried poultry.

The breast and thigh meat of fryers was processed as frozen or freeze-dried raw or cooked meat. Objective methods were compared with sensory methods for the evaluation of texture and juiciness in the meat. The effect of freezing at -23° and -191° C. on the quality of freeze-dried chicken and the effect of freeze drying on raw and cooked chicken meat were also determined.

Freeze-dried meat had poorer texture, less juiciness, higher shear resistance, and more expressible liquid than frozen meat had. Cooked chicken meat had significantly higher shear resistance after freeze drying than after freezing. The shear-resistance tests agreed well with panel judgments of texture so the objective test could be substituted for the sensory test. Shear resistance did not differ significantly between meat that was frozen or freeze dried before cooking.

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 ABSTRACTER: M. F. Tripple

7.67 α-TOCOPHEROL IN SOME ATLANTIC FISH AND SHELLFISH WITH PARTICULAR REFERENCE TO LIVE-HOLDING WITHOUT FOOD

Ackman, R. G., and M. G. Cormier (Fisheries Research Board of Canada Halifax Laboratory, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 24, No. 2, 357-373 (February 1967)

The deterioration of fishery products by nonbacterial factors has become increasingly important as the commercial application of procedures for reducing bacterial spoilage become more effective. Rancidity, which is the spoilage of lipids by oxidative changes, is the most important of these nonbacterial changes. By acting as antioxidants, tocopherols retard rancidity. The principal tocopherol in marine animals, α-tocopherol, varies widely in the tissues and organs of various species of marine animals. Some of these variations are less significant if the α-tocopherol content is considered in relation to the lipid content. The present study describes an analytical technique for the study of tocopherols from marine animals and the application of the technique.

Muscle tissue from four species of Atlantic fish (cod, dogfish, mackerel, and flounder) and one species of Pacific fish (sablefish) was examined for the content of total lipids and α-tocopherol. Values for α-tocopherol in both lean and fat muscle tissues were in the range of 210 to 330 µg. per gram of lipid. Lipids from cod and mackerel livers showed slightly higher values of 430 µg. per gram. These

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 ABSTRACTER: E. R. Weissman

7.89 A PORTABLE ROTATING KNIFE TENDEROMETER

Bjorksten, J., P. Anderson, K. A. Bouschart, and J. Kapsalis (Bjorksten Research Laboratories, Inc., Madison, Wisconsin 53701)
Food Technology 21, No. 1, 84-86 (January 1967)

A portable device is described for objectively determining the tenderness of a sample of meat. The correlation between results obtained with this device and those obtained when using a commercially available device is reported.

The device is designed to express in number-form one of the first subjective measures an individual makes when eating beef--the ease with which the meat is cut by a dull knife. The tenderometer employs a rotating dull knife to penetrate the meat and records the depth of the cut made in a set number of revolutions. The designers felt that this method would provide a summation measure of penetration, maximal extensibility, and shear through muscle bundles and connective tissues.

The most widely used, commercially available method for measuring the tenderness of meat has a reported correlation of -0.66 with organoleptic judgements made by a test panel. The portable tenderometer had a correlation of +0.57 with the scores reported by a taste panel. Both correlations are significant at the 1-percent level.

Rotational motion is produced by the drive motor (1), which is connected through the gear train (2) to the drive shaft (3). The drive shaft is connected

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 ABSTRACTER: E. R. Weissman

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values were interpreted as the result of a lipid integration process in the food chain, whereby the tocopherols produced by phytoplankton are redistributed with lipids throughout various lower life forms and small fish until similar levels were reached in the principal fats of larger fish. With a value of 630 µg. per gram, the metabolically active dark muscle (lateral line muscle) of cod was twice as rich in α-tocopherol in proportion to lipid as was the white muscle tissue from cod. Examination of starved cod showed that large amounts of α-tocopherol remained after the lipids had been depleted. Frozen flounder fillets did not show a significant amount of α-tocopherol after 4 to 8 months of frozen storage.

Eight species of Atlantic shellfish (lobster, oyster, bay and ocean quahogs, horse and ribbed mussels, periwinkle, and dogwinkle) were examined in their entirety. Lobster muscle was quite rich in α-tocopherol,with values of >1,200 µg. per gram. Oysters and quahogs lost their α-tocopherol after being held several weeks without food. This loss of α-tocopherol was accompanied in oysters by muscle weakening and an objectionable odor. Most filter-feeding species in a normal environment had 1 to 2.5 percent lipid and had α-tocopherol values of 300 to 600 µg. per gram of lipid. However, a high proportion of organic detritus in the diet of mussels from one area reduced this level in these mussels. The quahogs were quite low in lipid at ~0.60 percent and therefore were relatively high in α-tocopherol in proportion to lipid at >1,000 µg. per gram. Herbivorous periwinkles and accompanying predatory dogwinkles had the highest α-tocopherol contents on a fresh weight basis at 35 and 21 µg. per gram of tissue and had high values in proportion to lipid at ~850 µg. per gram. [49 references]

7.89

to the drive tube (8) by means of two miniature ball-bearing assemblies (7) mounted on the drive shaft with a pin. The bearing assemblies travel in slots in the drive tube, thereby transmitting rotational motion without hindering free axial motion of the drive tube. The knife is attached to the drive tube, which moves axially in ball bushings (9). The bushings are held by ball bearings (10) to allow rotational movement.

Axial force is applied to the drive tube and the knife is driven into the meat through a thrust bearing (4) by a constant force spring (5). The spring force is constant over the entire elongation, rather than proportional to the elongation.

The knife is a stainless-steel cup, 1.5 inches in diameter, with some of the leading edge removed to form a dull knife extension. The wall of cut muscle is prevented from falling into the path of the knife by a follower (13), which has a slight forward thrust imparted by a coil spring (11). Spikes (14) hold the sample to the blade. The area of the cut is recorded by a pen (15) on a drum (6) attached to the drive tube.

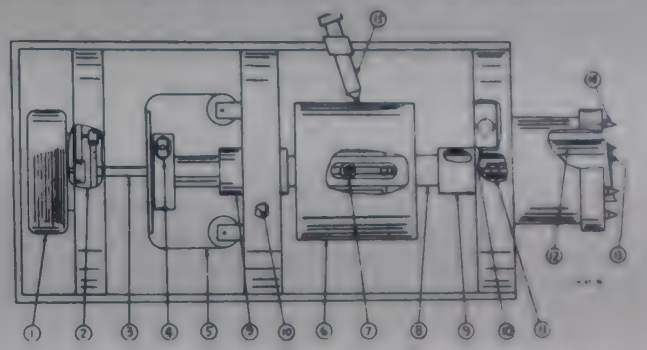

Figure 1. Diagrammatic sketch of the rotating knife tenderometer.

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It was found that the incubation temperature should be maintained to within ±0.5° C. Accurate timing of the incubation period from entry into heating bath to exit from dialysis bath was essential if the enzyme activity was to be calculated in units that could be compared to standards, to values from manual techniques, and to values from other laboratories.

The authors chose to calculate enzyme activity in terms of micrograms of p-nitrophenol produced per milliliter of milk in 30 minutes. The actual incubation period was timed at 15 min., 50 seconds, so readings taken from the calibration graph were multiplied by a factor of 1.9 in order to calculate enzyme activity in the desired terms. The incubation period used was adequate for the routine screening of pasteurized milk. The Gilcrease-Davis method for the examination of dairy products (1960) was used to check the results obtained by the automated method. The screening level was set at 2 µg. of p-nitrophenol per ml. of milk. All samples showing more than 2 µg. of activity were subjected to the standard manual method for confirmation of underpasteurization.

Because the method uses a colorimetric procedure, tests were made to determine whether the high, natural color of Jersey or Guernsey milk would interfere with the procedure. The method proved capable of handling these milks, as well as milk to which vitamins A, B complex, C, and D were added. Chocolate milk drinks gave false phosphate findings when analyzed by the automated method. [9 references]

7.80

Freeze-dried breast meat contained larger amounts of expressible liquid than did the frozen meat. Objective tests and panel judgments of juiciness of breast meat were in agreement. Here, the objective tests could be substituted for the sensory test.

Although the taste panel consistently found differences between frozen and freeze-dried thigh meat, little or no liquid could be found in any of the thigh meat by objective testing; in this instance, the objective test could not be substituted for the panel judgments. No significant differences in "water-holding capacity" were found between frozen and freeze-dried meat by the objective test; this test could not be substituted for the panel tests under the conditions used.

The freezing temperatures used did not effect the meat freeze-dried before cooking. The different freezing temperatures did result in detectable differences in meat freeze dried after cooking, but the differences were too small to be of practical importance.

Freeze drying adversely affected the breast meat more than it did the thigh meat. The breast meat was less tender, less juicy, had higher shear resistance, and more expressible liquid than did the thigh meat. Meat cooked after freeze drying had better texture and juiciness, lower shear resistance, and less expressible liquid than did the meat cooked before freeze drying. [27 references]

7.89 DRAINED WEIGHT OF FROZEN SHRIMP

Werren, J. C., and R. W. Weik (Division of Food Standards and Additives, Food and Drug Administration, Washington, D.C. 20204)
Journal of the Association of Official Analytical Chemists 50, No. 2, 275-278 (April 1967)

A study was begun in 1963 to obtain data on the relation between net weight and drained weight of glazed, raw, frozen shrimp products. The results of the study revealed some shortcomings in the Association of Official Analytical Chemists (AOAC) procedure (10.008) for determining the drained weight of frozen shrimp. The Fish and Wildlife Service (FWS) method for determining drained weight was evaluated in preliminary studies. The FWS method was slightly modified and was compared with the AOAC procedure during the analysis of commercial packs of glazed, raw frozen shrimp. Results obtained during the comparative study showed that the modified FWS method was preferable to the AOAC procedure for determining drained weight. A collaborative study was initiated to evaluate the modified FWS method.

Commercial samples of shrimp consisted of the following: (1) 200 packages, each about 12 oz. in weight, of individually quick-frozen, peeled, and deveined shrimp prepared from fresh shrimp; (2) 70 packages, each about 12 oz. in weight, of individually quick-frozen, peeled, and deveined shrimp prepared from thawed, frozen, headless shrimp; and (3) 36 packages, each about 2.2 lb. in weight, of

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 ABSTRACTER: M. F. Tripple

8.53 VOLATILE COMPOUNDS PRODUCED BY IRRADIATION OF BUTTERFAT
(*)

Merritt, Charles, Jr., D. A. Forss, Pio Angelini, and M. L. Bazinet (Pioneering Research Division, U.S. Army Natick Laboratories, Natick, Massachusetts)
Journal of the American Oil Chemists' Society 44, No. 2, 144-146 (February 1967)

Carbonyl compounds in lipid systems are regarded as major contributors to the flavor caused by irradiation. The volatile compounds produced by irradiation of butterfat were determined because a knowledge of the presence and amounts of hydrocarbons and other compounds would help in understanding irradiation flavor and mechanisms.

Anhydrous butterfat was irradiated at 6 megarads in a special glass reaction flask. The headspace and samples of total condensate were examined by mass spectrometry combined with wide-range gas chromatography between -180° C. and 125° C. The nature and amounts of volatile compounds were not greatly influenced by irradiation of butterfat with or without oxygen, or by storage for 1 or 9 weeks.

The compound produced in the greatest amount was carbon dioxide. Of the remaining compounds, aliphatic hydrocarbons were the most predominant, both in number and amount. Aliphatic oxygenated compounds, including carbonyl compounds, were isolated in relatively small amounts. The following compounds were positively identified: C_{1-13} n-alkanes, C_{4-9} 2-methylalkanes, C_{2-14} alk-1-enes, C_{2-9} alk-1-ynes, C_{2-5} n-alkanoic acids, C_{1-5} n-alkan-1-ols and propan-2-ol,

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 ABSTRACTER: M. M. Gwin

7.89 A STUDY OF THE NET WEIGHT AND DRAINED WEIGHT RELATIONSHIP OF FROZEN SHRIMP PRODUCTS

Werren, J. C., Arthur R. Johnson, and R. W. Weik (Division of Food Standards and Additives, Food and Drug Administration, Washington, D.C.20204)
Journal of the Association of Official Analytical Chemists 50, No. 2, 278-282 (April 1967)

A project was begun in 1963 to obtain information about current industry practices and technology in the handling, processing, and packaging of frozen shrimp products. The project also included a study of the relation between net weight and drained weight of glazed, raw, frozen shrimp and a thorough examination of the methods for determining drained weight of glazed, raw, frozen shrimp products. The results from a preliminary study revealed some deficiencies in the Association of Official Analytical Chemists (AOAC) procedure (10.008) for determining drained weight. The wording in the method "of how to remove the glaze and thaw the shrimp" introduced a variable that was too dependent upon the interpretation of the analyst.

The Fish and Wildlife Service (FWS) method for determining drained weight was modified by thawing the frozen shrimp product in a plastic bag to allow recovery of the glaze and drip. Results of testing showed that the FWS method was basically better than the AOAC method; however, some shortcomings in the FWS method were revealed. The plastic bags were unsuitable because they interfered with the deglazing and thawing of the shrimp and were susceptible to puncture by tail spurs

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 ABSTRACTER: M. F. Tripple

9.17 AN EVALUATION OF THE AIR BUBBLE CURTAIN
(*) AS A BARRIER TO ALEWIVES

Kupfer, George A., and William G. Gordon
Commercial Fisheries Review 28, No. 9, 1-9 (September 1966)

Large migrations of alewives into the Milwaukee, Kinnickinnic, and Menomonee Rivers during May, June, July, and part of August have occurred each year since 1960. Soon after entering these rivers, the fish die in large numbers, which causes a sanitation problem and depresses the value of land along the rivers.

The Bureau of Commercial Fisheries conducted an initial survey of the situation in March 1964. The survey revealed limitations on available devices that could be used to control migrations up the rivers. Because of low water and vessel navigation in the Menomonee, Kinnickinnic, and lower Milwaukee Rivers, barriers could not be used in those portions normally navigated by large lake vessels.

An air-bubble-curtain apparatus has been developed by the Bureau of Commercial Fisheries, and the practicality of the curtain in guiding Atlantic herring has been demonstrated. Air pumped through perforated polyethylene pipe made an air curtain that tended to direct the movements of young herring in clear water. A study was begun to determine the effectiveness of the air-bubble curtain and to assess its possible application as a permanent control of the alewives.

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 ABSTRACTER: E. R. Weissman

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of the shrimp. The drip liquid obtained was of dubious value because of the dilution of variation in the glaze from the shrimp.

The data reported in this paper were obtained from the second part of a project that consisted of developing a method and using the method to obtain data from commercial packs of glazed, frozen shrimp products to establish the relation between the net weight and the drained weight of the shrimp.

With the modified AOAC procedure, frozen shrimp are placed in a shallow pan under a gentle spray of fresh water (68°±5° F.). The spray is continued until the shrimp are completely thawed. The shrimp are spread out evenly in a standard No. 8 wire sieve (12 in. in diameter for packages over 12 oz. net weight and 8 in. in diameter for packages 12 oz. and less). The sieve is tilted at about 30° to facilitate drainage, and the shrimp are drained for 2 min. before being transferred to a tared pan. Drained weight equals weight of drained shrimp and pan minus weight of the tared pan.

The FWS procedure was modified to provide a temperature range for the water bath that allowed complete thawing of the shrimp. The frozen shrimp are placed in a 4-gal. container and fresh water (75°-87° F.) is introduced from the bottom at a flow rate of about 1-3 gal. per minute. After the glaze has been removed and the shrimp are thawed, they are emptied into a standard No. 8 wire sieve and the procedure is continued, following the modified AOAC procedure.

The study showed that the modified FWS method is better for determining the weight of glazed, raw, frozen shrimp products than is the AOAC method. The FWS method permits complete thawing of the shrimp and allows the analyst to evaluate the frozen and thawed product and to detect and estimate the severity of dehydration (freezer burn).

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Gill nets were set above and below the air-bubble curtain to assess its effectiveness as a barrier before the tests started. After the first erratic results, the downstream net consistently caught more fish than the upstream net.

A commercial minnow dealer who regularly fished in the entire river and had daily contact with the areas affected by the study reported that alewives were found in that stretch of the river above the curtain.

Although the study did not give conclusive proof of the effectiveness of the air curtain as a barrier, the authors believe the results may have been biased by several factors. The location of the curtain during the study may have hindered its effectiveness because the fish had only a few alternate routes when the curtain was reached. Thus, migration through the curtain may have been due to the large number of fish involved, the lack of alternative routes, and a "forcing" of the fish through the barrier. Nevertheless, results indicate that the curtain did reduce the migration of alewives.

9.17 BAIT SHRIMP (PENAEUS DUORARUM) IN TAMPA BAY, FLORIDA--
BIOLOGY, FISHERY ECONOMICS, AND CHANGING HABITAT

Saloman, Carl H.
Special Scientific Report--Fisheries No. 520, 16 pp. (October 1965)

(Abstract of this article appears under 1.85 page 1 - April 1967)

7.89

glazed, raw, frozen headless shrimp. The samples from three commercial shrimp packers were divided and sent to 11 collaborators with instructions to determine the drained weight by the modified FWS method.

The modified FWS method uses a wire mesh basket that is large enough to hold the contents of one package of shrimp and that has openings small enough to retain all pieces of shrimp. An expanded metal test-tube basket or the equivalent that is fully lined with standard 16 mesh per linear inch insect screen is satisfactory. The contents of an individual package are placed in the wire mesh basket and immersed in a 4-gal. container of fresh water (80°±5° F.) so that the top of the basket extends above the water level. Water of the same temperature is introduced at the bottom of the container at a flow of 1-3 gal. per min. As soon as the shrimp are thawed, which is determined by loss of rigidity, all the shrimp material is transferred to a sieve and evenly distributed. For the contents of a package weighing more than 1 lb., a 12-in. sieve is used; for a package weighing less than a pound, an 8-in. sieve is used. The sieve is inclined to about 30° from horizontal to facilitate draining. Two min. after the shrimp are placed in the sieve, they are transferred to a tared pan and weighed. This weight minus the weight of the pan equals drained weight of the shrimp.

The results indicate good precision for within-laboratory repeatability. The flow rate of 1-3 gal. per min. is as accurate as the prescribed rate of 6 gal. per min. The authors recommend that the method, with the suggested change in flow rate of water, be adopted as official.

8.53

C_{2-8} n-alkanals and 2 methylbut-2-enal, $C_{3-5,7}$ alkan-2-ones, C_{1-4} n-alkyl formates, vinyl and isolamyl formate, methyl acetate and methyl n-hexanoate, and carbon dioxide.

8.53 VOLATILE COMPOUNDS PRODUCED BY COPPER-CATALYZED OXIDATION
OF BUTTERFAT

Forss, D. A., Pio Angelini, M. L. Bazinet, and Charles Merritt, Jr. (Pioneering Research Division, U.S. Army Natick Laboratories, Natick, Massachusetts)
Journal of the American Oil Chemists' Society 44, No. 2, 141-143 (February 1967)

An experiment was conducted to determine which volatile compounds were produced by copper-catalyzed oxidation. The amounts of all volatile compounds that were produced were also determined. The authors avoided artifacts by using an all glass system and by not using solvents.

Anhydrous butterfat treated with copper and stored in the dark under vacuum at 38° C. for 9 weeks yielded C5-8 n-alkanes, acetic acid, and the $C_{4,5,7,9}$ alkan-2-ones. Anhydrous butterfat stored under oxygen for 1 week yielded $C_{1,2,3,5-7}$ n-alkanes, $C_{2,4-6,8}$ alk-1-enes, $C_{7,8}$ alk-1-ynes, C2-6 n-alkanoic acids, ethanol, C_{2-7} n-alkanals, 3-methylbutanal and 4-methylpentanal, C1-4 n-alkyl formates, ethyl acetate and propionate, n-propyl acetate and propionate, and butanone. Treatment with and without oxygen also yielded carbon dioxide. All samples, including those that were not treated with copper, yielded butane-2, 3-dione.

[20 references] [Abstracter: M. M. Gwin]

COMPOSITION OF OXIDIZED BUTTERFAT

0.36 (*)

HISTOLOGICAL STUDIES OF POST-MORTEM CHANGES IN SARCOMERE LENGTH AS RELATED TO BOVINE MUSCLE TENDERNESS

Gothard, Robert H., A. M. Mullins, R. F. Boulware, and S. L. Hansard (Louisiana State University, Baton Rouge 70803)
Journal of Food Science 31, No. 6, 825-828 (November-December 1966)

A study was conducted on the effect of post-mortem muscle contraction on ultimate tenderness in the muscles of 12 beef animals of similar weight and grade. State of contraction was determined by measurement of sarcomere lengths in the longissimus dorsi and semimembranosus muscles. To prevent further contraction, the histological samples that were removed at various intervals post mortem were treated with ethylenediaminetetraacetate (EDTA). Muscle fibers were observed with a phase-contrast microscope, and sarcomeres were measured with a filar micrometer. The patterns of muscle contraction for each animal were plotted during a 7-day period of aging. The state of muscle contraction after 7 days appeared to have a greater influence on subsequent tenderness than did the state of contraction at the time of maximum rigor mortis. Contraction exerted significant influence, although it did not appear to be the factor most responsible for final tenderness. Considerable lengthening of the sarcomeres occurred in a normal manner during the aging period. The semimembranosus muscles routinely contracted less than the longissimus dorsi muscles did during rigor mortis, and the semimembranosus muscles were more relaxed after 7 days of aging. The semimembranosus muscles were consistently less tender than the longissimus dorsi muscles were at slaughter, but the semimembranosus muscles were more tender after aging for 7 days.

[Abstracter: M. M. Gwin]

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0.5 (*)

BACTERIAL GROWTH RATE IN THE SEA: DIRECT ANALYSIS BY THYMIDINE AUTORADIOGRAPHY

Brock, Thomas D. (Department of Microbiology, Indiana University, Bloomington)
Science 155, No. 3758, 81-83 (January 6, 1967)

The study of microbial growth as it occurs in nature was accomplished by autoradiography with tritiated thymidine. The epiphyte Leucothrix mucor was used because it is a large filamentous bacterium with a characteristic morphology that makes it recognizable in natural collections. The technique of autoradiography was developed initially with pure cultures. The derivation of a constant was arrived at by studying the relation between rate of growth and the rate of accumulation of radioactive cells. This constant was used to calculate rate of growth in natural material and in two-membered cultures of L. mucor epiphytically growing on pure cultures of marine algae. Under the conditions used, the growth rate of a two-membered culture of L. mucor and the red alga Antithamnion sarniense was 94 minutes. In natural habitat, the growth rate of a sample of L. mucor from Iceland was 685 min.; a sample from Long Island Sound took 660 min. No evidence was recorded of the preferential growth in the basal portion of bacteria filaments nearest the algal surface when L. mucor was cultured. However, filamentous growth in nature was nonrandom and growth was clustered in some regions.

[Abstracter: M. M. Gwin]

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2.05 (*)

SALMONELLA...WHAT YOU CAN DO NOW -- CONTROL IN MANUFACTURE AND DISTRIBUTION

Ruark, R. C. (Corn Products Co., New York, N.Y.)
Food Engineering 39, No. 1, 115-121 (January 1967)

Although much is already known about the nature of Salmonella, the problem of control still remains. The major regulations of the Food and Drug Administration and the U.S. Department of Agriculture pertaining to Salmonella can be simply stated--Salmonella must not be present in either food ingredients or food products. However, other controls are necessary in the purchase of raw materials, plant sanitation, packaging and distribution, and in the home. Excellent manufacturing controls have been found for various foods. Proper heating and acidity of grains and feeds provide effective controls, and sterility is essentially assured in the manufacture of mayonnaise and acidic salad dressings. The conclusions of the author are that Salmonella control must be exercised at every stage from the farm to the home, and all persons connected with the food industry should be educated in the aspects of Salmonella.

[Abstracter: M. M. Gwin]

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2.3 (*)

B.C. FISH PROCESSING PLANT BIG, FAST -- AND EXPENSIVE

Curtis, T.
Food In Canada 26, No. 11, 43-45 (1966)
RPC Food Science Abstracts, Abstract No. 66/1414, p. 472 (December 1966) (Research and Productivity Council, P.O. Box 1236, Fredericton, New Brunswick, Canada)

In a British Columbia fish-processing plant, new developments have taken place that shorten the processing time before cold storage and reduce the handling so that firmer texture and freshness are obtained in the final product. Automatic control is essential from the time the fish reach the wharf until they are completely processed. Some of the equipment used in the plant are described and illustrated.

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2.3 FISH PROCESSING

United States Patent 3,241,179
Abstracts from Current Scientific and Technical Literature 19, Abstract No. 2930, p. 550 (December 1966)

The lower part of the belly side of fish is opened by two angularly related cuts made from the belly towards the backbone.

0.3 EGG YOLK REACTION OF CLOSTRIDIUM BOTULINUM TYPE E IN DIFFERENT BASAL MEDIA

Hobbs, G. (Torry Research Station, Aberdeen, Scotland), and Anita Stiebrs (Oregon State University, Corvallis), and M. W. Eklund (Bureau of Commercial Fisheries Technological Laboratory, Seattle, Washington)
Journal of Bacteriology 93, No. 3, 1192 (March 1967)

The production of a precipitate in Clostridium botulinum on an agar media containing egg yolk has been used in the differentiation and isolation of this group of bacteria. The modification of the egg yolk media by using liver-veal-agar (LVA) as a base, however, is not completely satisfactory because C. botulinum Type E does not always give a typical reaction. Sometimes colonies of these organisms produce a very faint pearly layer and sometimes no layer is produced. This pearly layer is used to differentiate C. botulinum Type E from other clostridia. Therefore, if the layer is not formed, some colonies of Type E and some nontoxic clostridia would not be recognized. When LVA-egg yolk was streaked with marine mud samples, no colonies with pearly layers were found in the LVA-egg yolk medium. It is apparent from these results that if LVA is used as a base for the egg yolk medium, the chances of isolating C. botulinum Type E may be reduced. [Abstracter: M. M. Gwin]

(Abstract of this article appears under 6.32 page 13 - April 1967)

Hamilton, R. D., and A. F. Carlucci
Nature 211, 483-484 (July 30, 1966)

0.5 USE OF ULTRA-VIOLET IRRADIATED SEA WATER IN THE PREPARATION OF CULTURE MEDIA

0.36 ALTERATIONS IN THE CONTRACTURE BAND PATTERNS OF UNFROZEN AND PRERIGOR FROZEN OVINE MUSCLE DUE TO VARIATIONS IN POST-MORTEM INCUBATION TEMPERATURE

Cook, C. F., and R. G. Wright (University of Sydney, New South Wales, Australia)
Journal of Food Science 31, No. 6, 801-806 (November-December 1966)

Because of conflicting evidence as to the effect of post-mortem treatment on the ultrastructure of muscle, this experiment was conducted to investigate the effect of post-mortem incubation temperature on the contraction band patterns and on the fiber ultrastructure of unfrozen and frozen prerigor sheep muscle.

Samples of unfrozen and frozen prerigor lamb muscle were incubated for 24 hours post mortem at six temperature levels between 0° and 40° C. The samples were examined histologically and electron-micrographs were taken. The micrographs showed that variations in temperature caused the muscle fibers to be in various states of contraction. The variations in sarcomere length of unfrozen and frozen prerigor muscle did not follow any specific pattern in relation to temperature. All the observed transverse striations were defined as components of the sarcomere. Frozen prerigor muscle incubated at 30° and 40° C. showed severe disruption of the Z lines. The Z-line material, however, was present in a disoriented state. The H zones and M lines were seen in all samples, with their boundaries clearly defined, and their lengths were constant in samples from all the treatments. [16 references] [Abstracter: M. M. Gwin]

2.3 APPARATUS FOR POSITIONING FISH BEING FED TO A FISH PROCESSING MACHINE

British Patent 1,041,660
Abstracts from Current Scientific and Technical Literature 19, Abstract No. 2693, p. 504 (November 1966)

The apparatus described is for positioning fish being fed to a processing machine. This apparatus consists of a fish support with a support for the head; a fish trough, which moves through an arc and through one end of the fish support; and a sensing lever, which senses the thickness of the fish as it moves along the support and operates the head support.

An apparatus for gripping the fish by their sides and moving them around in a circle, and then stopping them at processing stations is described.

British Patent 1,048,149
Abstracts from Current Scientific and Technical Literature 20, Abstract No. 200, p. 38 (January 1967)

2.3 APPARATUS FOR CONVEYING FISH DURING PROCESSING

2.05 SALMONELLA...WHAT YOU CAN DO NOW -- RECENT OCCURRENCE

Lennington, K. R. (Food and Drug Administration, Washington, D.C.)
Food Engineering 39, No. 1, 121-122, 124 (January 1967)

Despite a great awareness of the occurrence of Salmonella and the many preventive measures taken, Salmonella has not been controlled effectively. Salmonella was recently found in the enzymes and glandular materials from animals, such as granulated pepsin and pancreatin. The conditions under which yeast is cultured and produced also seem to be conducive to the growth of Salmonella if the yeast plant is infected or seeded with the organism. Raw fish, either in the round or dressed, may be contaminated through pollution, storage, insanitary handling, or distribution. The material found in cochineal--which when processed produces the red coloring principal, carminic acid--was found to be contaminated with Salmonella. Furthermore, carmine-red processing operations do not inhibit the growth of the organism. [Abstracter: M. M. Gwin]

This review of aflatoxin produced by Aspergillus flavus covers the following topics: fungi producing aflatoxin, natural occurrence of aflatoxin, factors affecting aflatoxin formation, production of aflatoxin in culture, and research studies on aflatoxin. [39 references] [Abstracter: M. F. Tripple]

Hesseltine, C. W., O. L. Shotwell, J. J. Ellis, and R. D. Stubblefield (Agricultural Research Service, U.S. Department of Agriculture, Peoria, Illinois)
Bacteriological Reviews 30, No. 4, 795-805 (December 1966)

2.05 AFLATOXIN FORMATION BY ASPERGILLUS FLAVUS

3.2383 (*) TOXICITY PROBLEMS OF POLYVINYL CHLORIDE AND AUXILIARY COMPONENTS FOR FOOD PACKAGING

Grimm, P.
Polimery 9, No. 11, 481-482 (1964)
Abstracts from Current Scientific and Technical Literature 20, Abstract No. 61, p. 14 (January 1967)

Toxicity of stabilizers and lubricants is discussed and a chromatographic method for the determination of organo-tin compounds is described.

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6.32 (*) LIPIDS AND LIPOPROTEIN COMPLEX IN PHOTOSYNTHETIC TISSUES II - PIGMENTS AND LIPIDS IN BLUE-GREEN ALGA, ANACYSTIS NIDULANS

Hirayama, Osamu (College of Agriculture, Kyoto Prefectural University, Kyoto, Japan)
Journal of Biochemistry 61, No. 2, 179-185 (February 1967)

The pigment, quinone, and lipid compositions were determined in whole cells and lamellae of a blue-green alga (Anacystis), and a comparison was made with the findings in whole leaves and lamellae of spinach. In general, the alga had a simpler composition of these substances than spinach. The alga lacked components, such as lecithin, phosphatidyl inositol, tocopherol, tocopherolquinone, sterol, sterol ester, and polyenoic acids, which are commonly found in higher plants. [18 references] [Abstracter: M. M. Gwin]

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4.11 (*) THE ISOLATION OF THE POLYUNSATURATED ACIDS OF THE FISH OILS AS THEIR METHYL ESTERS BY PREPARATIVE SCALE GAS CHROMATOGRAPHY

Hardy, R., and J. N. Keay (Torry Research Station, Ministry of Technology, Aberdeen, Scotland)
Journal of Chromatography 27, No. 2, 474-479 (April 1967)

Oleic ($C_{18:1}$), linoleic ($C_{18:2}$), and linolenic acids ($C_{18:3}$) can be obtained in a pure state by low temperature crystallization, urea adduct formation, polybromide preparation, countercurrent distribution, adsorption chromatography, and partition chromatography. The highly unsaturated acids of fish oils ($C_{18:4}$, $C_{20:5}$, and $C_{22:6}$) cannot be isolated by these techniques. An exception is partition chromatography using a reversed phase, acetonitrile-methanol/heptane, which gives excellent results for $C_{22:6}$, $C_{22:5}$, and $C_{20:5}$ methyl esters. This procedure has disadvantages in that it uses large volumes of toxic solvent, and it may not be suitable for the continuous preparation of large quantities of esters. Analytical gas-liquid chromatography gives excellent separations of the required polyunsaturated esters, but this method has not been exploited on the preparative scale. The authors decided to adapt a commercial preparative instrument for this purpose. A procedure was developed that makes possible the continuous preparation of highly purified methyl esters of octadecatetrenoic acid ($C_{18:4}$), eicosapentenoic acid ($C_{20:5}$), and docosahexenoic acid ($C_{22:6}$).

Cod-liver oil, which contained all three of the required acids, was saponified by a cold procedure. The mixed acids were analyzed. It was deemed desirable to work with a simplified concentrate of the polyunsaturated esters because this method would facilitate clean separation of these esters in preparative gas chromatography. A concentrate of the polyenoic esters was prepared. The preparative gas chromatography is described. [12 references] [Abstracter: M. F. Tripple]

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9.16 (*) FISH FARMING--THE INTENSIVE PRODUCTION OF FISH FOR HUMAN FOOD

Lucas, C. E. et al.
One Hundred and Seventy-Ninth Scientific Meeting, Seventy-Fourth Scottish Meeting, Department of Agriculture and Fisheries for Scotland, Marine Laboratory, Torry, Aberdeen, Scotland
Proceedings of the Nutrition Society 25, No. 2, 120-144 (1966)

"Fish cultivation" by C. E. Lucas, pp. 120-126.

"Ecological problems of marine fish farming" by J. H. Steele, pp. 126-129.

"Engineering aspects of fish farming" by W. Frazer, pp. 129-133.

"Sea fish culture in Brtain" by J. E. Shelbourne and C. E. Nash, pp. 133-140.

"Socio-economic aspects of fish farming" by C. F. Hickling, pp. 140-144.

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4.11 ANALYSIS OF PHOSPHOLIPIDS

Pries, C., A. Aumont, and C. J. F. Böttcher (Gaubius Institute of the University, Leyden, The Netherlands)
Biochimica et Biophysica Acta 125, No. 2, 277-287 (October 3, 1966)

The step-wise hydrolysis of phospholipid mixtures developed by Dawson (1960) was modified for application to a whole phospholipid mixture as well as to fractions obtained by silica-gel column prefractionation. The combination of silica-gel column fractionation and step-wise hydrolysis allowed a discrimination between diacyl- and monoacylglycerophosphatides.

The proposed improvements in the technique of step-wise hydrolysis are as follows: modification of the mild alkaline hydrolysis gives a quantitative deacylation with a minimum of additional breakdown of the polar part of the phosphatides; use of a Folch partition after alkaline hydrolysis prevents interference by emulsions or interfacial fluff, even though the total sphingolipid content of the sample may be as high as 60-70 percent; use of relatively small quantities of alkali gives a better paper-chromatographic separation of the glycerophosphate esters; determination of the phosphorus content of the various fractions, and of the upper and lower layers separately after partition, and use of the paper-chromatographic separation of the glycerophosphate esters only as a means of determining the ratio of the components results in an increase in accuracy when compared with known procedures; and modification of the acid hydrolysis prevents loss of phosphate esters due to the washings necessary when using trichloroacetic acid-mercuric chloride. [13 references] [Abstracter: M. F. Tripple]

9.16 WHY NOT "INSTANT FISH" FARMS?

Vanderplank, F. L.
New Scientist 33, No. 528, 42 (January 5, 1967)

Nothobranchius taenipygus, a ravenous feeder on mosquito and other water-living insect larvae, has been used in the biological control of mosquitoes in Africa. This fish lays drought-resistant eggs that will hatch within 4 to 6 days of being placed in water and grow to full size in 3 or 4 weeks in the minimum of water. In protein-short Africa, these fish may be raised for food.
[Abstracter: M. F. Tripple]

3.2383 METHOD OF PACKAGING PERISHABLE COMESTIBLES AND PRODUCT

British Patent 1,037,877
Abstracts from Current Scientific and Technical Literature 19, Abstract No. 2530, p. 470 (October 1966)

A package for refrigerated foods, such as poultry, fish, and vegetables, has been patented. It consists of a paperboard carton with a wrapper of a hydrous sheet of water-absorptive, matted cellulosic fiber bonded through a grid of thermoplastic fibers to a flexible film of water-resistant, moisture vapor-impermeable thermoplastic resin.

6.32 UREASE ACTIVITY IN BLUE-GREEN ALGAE

Berns, Donald S., Peter Holohan, and Edith Scott (Division of Laboratories and Research, New York State Department of Health, and Biochemistry Department, Albany Medical College, Albany, New York)
Science 152, No. 3725,1077-1078 (May 20, 1966)

Conflicting reports about the use of urea as a nitrogen source by blue-green algae plus lack of published information about the mechanism of urea metabolism in algae led the authors to investigate the origin and nature of urea degradation by phycocyanins. They detected an apparent enzymatic hydrolysis of urea both in whole blue-green algae and in cell extracts. Urease was noted as an intracellular component in cultures that were bacteria free. The greatest activity occurred in the Cyanophyta, though indications are that there is urease activity in the higher algae also. [Abstracter: L. Baldwin]

1.0154 U.S.-JAPAN FISHING BUDGETS -- A REVEALING COMPARISON

Anonymous
Fish Boat 12, No. 5, 11 (May 1967)

The budget of the Japanese Fisheries Agency from April 1967 to March 1968 is $67.3 million, which is 10 percent more than that for the previous year. The budget for the U.S. Bureau of Commercial Fisheries for the fiscal year 1968 is slightly more than $46 million. The author contends that the difference of over $21 million in financial backing is one important reason why Japan is second in world fishery catch and the United States is fifth.

The largest share of the Japanese budget, some $37.4 million, is to be spent on improvement of fishing ports. Under the heading of fishery technological improvement, a wireless communication system for forecasting hydrographic and fishing conditions will be added to the existing facsimile and radio communication systems. A new government research vessel is now under construction as part of the overseas fisheries development program. The vessel will be used for exploratory purse seining off New Zealand to help determine the extent to which the Japanese Government should license the operation of deepwater purse-seine vessels.

It is proposed that funds from the Japanese budget be used to consolidate the 1,400 fishing cooperatives within 4 years to improve administration of the fishery. [Abstracter: E. R. Weissman]

2.1121 CATCH DOUBLED WITH PARAVANE-TYPE TRAWL DOORS

Anonymous
Commercial Fishing 5, No. 4, 35 (December 1966)

A 270-ton side trawler, using a large mesh net and a new type of paravane otter boards, caught about twice the weight of fish as trawlers working alongside with conventional gear. The experimental otter boards are based on the paravane principles used in minesweeping and can be set to maintain a preset height over the sea bed. With a box trawl weighted to keep the footrope in contact with the bottom, there is considerable reduction in drag as the doors are held clear of the bottom and do not plow. Because the ground drag from plowing is reduced, surplus power becomes available to pull bigger nets. The system is reported to increase net depth from 8 to 30 feet by positioning the paravanes that spread the ground wires about 50 feet above the bottom. The paravanes stay in the water when the trawl is brought aboard. [Abstracter: M. F. Tripple]

2.1121 PRAWNING IN N.S. [NEW SOUTH] WALES -- PT. 2

Gorman, T. B. (New South Wales Fisheries Laboratories, Australia)
World Fishing 15, No. 12, 44-46 (December 1966)

Plans and descriptions are given for six highly original and unusual trawl nets used in Australia. The trawl nets are basically of four-seam design; however, modifications of the original design have produced a wide variety of nets.
[Abstracter: E. R. Weissman]

2.116 QUANTITATIVE ASSAY OF BALTIC COD CONCENTRATIONS BY MEANS OF A SONIC DEPTH FINDER

Yudanov, K. I.
Rybnoe Khoziaistvo No. 1, 26-32 (1962) (In Russian)
OTS-63-31096 (1963), U.S. Department of Commerce, Office of Technical Services, Washington, D.C.
World Fisheries Abstracts 15, No. 4, 23-24 (October-December 1964)

One of the most important functions of fish-searching hydroacoustics is the quantitative measurement of the fish concentrations detected by the instruments. The practical evaluation of these measurements has presented certain technical difficulties, the most important of which are related to the sound-reflecting properties of the fish and to the relation between the strength of the echo and the density of the fish concentrations. This solution is comparatively simple in the case of the less dense fish concentrations, such as cod accumulations in the Baltic Sea. Examples of the procedures are given, showing that the echo sounder makes possible quite accurate determination of the number of fish in those accumulations. The same method can be used for quantitative determinations of deconcentrated fish, for example cod and haddock. Echo-finding surveys of accumulations of certain density make it possible to follow the redistribution of the accumulations, to record the variation in the density of the accumulations, and to record variations in the density in accordance with hydrological and biological factors. The gathering of all these data and their systemization will help make for more accurate commercial fish prognoses, thus a clearer idea of the cod stocks in a body of water and of the degree in which hydrobiological factors and intensity of fishing influence these stocks will result. [Extractor: L. Baldwin]

2.117 FIBERGLASS TRAWLER CALLED START OF 'NEW ERA'

Anonymous
Fishing Gazette 83, No. 10, 10 (October 1966)

"Foam-core" construction has been incorporated in a newly introduced 80-ft. trawler. The hull is made of a 3-5/8-in. sandwich of tough, lightweight laminates of fiberglass with an integral thermal-insulating structural core system. The deck is similarly fabricated, but with a thinner core.

Many advantages are claimed for this type of construction. It is said that maintenance costs will be greatly reduced because periods between haul outs will be substantially extended; that this type of hull will give greater strength than conventional wood or steel construction with far less weight; that for this reason the ratio of payload to weight will be greatly increased; and that full insulation of the hull is provided at no extra cost.

The manufacturer further claims that this unique manufacturing process allows design of advanced hull forms, which would be prohibitively expensive with steel or wood construction.

The first of the new fiberglass craft will be a combination trawler purse seiner with a loaded displacement of 227 tons, length at waterline 77 ft., beam 22 ft., and draft 10 ft. It will have an individual stateroom for the captain and accommodations for a crew of six.

The builder expects South American fishing grounds to be the most promising potential market for the new series of boats. [Abstracter: E. R. Weissman]

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3.2343 SUPERCHILLING OF FISH -- THE POSITION TODAY

Merritt, J. H., I. Livingston, and J. M. Shewan (Torry Research Station, Ministry of Technology, Aberdeen, Scotland)
Modern Refrigeration 69, 438-441, 443 (May 1966)

Two methods of superchilling fish--in bulk and in boxes--and of processing the superchilled fish are discussed. [Abstracter: M. F. Tripple]

3.2343 IMPROVEMENTS RELATING TO FREEZE-DRYING

British Patent 1,008,814
Abstracts from Current Scientific and Technical Literature 19, Abstract No. 249, p. 48 (January 1966)

In this freeze-drying process, the volatile constituents of the product are collected in a series of low-temperature condensers, from which they can be analyzed or recombined with the dried product.

7.591 PHOSPHOGLUCOMUTASE. III - PURIFICATION AND PROPERTIES OF PHOSPHOGLUCOMUTASES FROM FLOUNDER AND SHARK MUSCLE

Hashimoto, Takashi, and Philip Handler (Department of Biochemistry, Duke University School of Medicine, Durham, North Carolina 27706)
Journal of Biological Chemistry 241, 3940-3948 (September 10, 1966)

This paper describes the procedures used to isolate the phosphoglucomutases of flounder and shark muscle. These enzymes have a molecular weight of about 63,000, as shown by ultracentrifugal and phosphate analysis. They require α-D-glucose 1,6-diphosphate and Mg^{++} for activity, are stimulated by preincubation with imidazoles and Mg^{++}, and are phosphorylated by glucose 1,6-diphosphate and dephosphorylated by α-D-glucose 1-phosphate. The flounder and shark enzymes are quite labile below pH 5.0; at pH 7.4, they show a significant level of glucose 1,6-diphosphatase activity. The activity of the flounder enzyme is increased by the formation of 1 mole of mercaptide of p-mercuribenzoate per mole of enzyme.

After the period of time necessary for the reaction catalyzed by the rabbit enzyme to come to thermodynamic equilibrium, the phosphate of glucose diphosphate had failed to achieve isotopic equilibrium with that of the glucose monophosphates. The flounder P-glucomutase system behaved in a similar manner, but isotopic equilibrium was achieved more rapidly than with the rabbit enzyme. [28 references.] [Abstracter: M. F. Tripple]

6.193 QUALITY OF MEAL FROM DIFFERENT COUNTRIES. CORRELATION BETWEEN ANALYTICAL CRITERIA AND THE NUTRITIVE VALUE

Laksesvela, B., and A. T. Bone
Meldinger fra S.S.F. Sildolje og Sildermelindustriens Forskningsinstitutt No. 3 (September 1965) (Tjaereviken, Norway)
Journal of the Science of Food and Agriculture 18, No. 2, i-79 (February 1967)

The nutritive values of fish meals from various countries were compared. The protein efficiency ratio (PER) values varied by more than 40 percent when the fish meals were fed to chicks. The crude protein value varied by only 15 percent when the fish meals were fed to chicks as supplements to cereals plus soybean meal. At low pepsin strengths of the insoluble protein, the pepsin solubility varied by 37 percent and correlated with the chick tests. Available lysine did not correlate with growth but it did correlate with PER when the following correction was made:

$$\text{available lysine} = \frac{\text{available lysine} \times 100}{\text{total protein} - (\text{water-soluble protein} \times 0.33)}$$

[Abstracter: E. R. Weissman]

6.190 CONDENSED FISH SOLUBLES IN FEEDS

Miwa, Katsutoshi
Chemical Abstracts 62, 9701a (April 12, 1965)

9.13 IN VITRO INCORPORATION OF PALMITATE-1-^{14}C INTO SEVERAL GLYCEROLIPIDS BY NORMAL AND AND REGENERATING RAT LIVER FRACTIONS

Johnson, Ralph M., and J. M. Lederkremer (Institute of Nutrition and Food Technology and Department of Physiological Chemistry, Ohio State University, Columbus)
Archives of Biochemistry and Biophysics 115, No. 3, 598-605 (September 9, 1966)

A study was made of the requirements for the incorporation of palmitate-1-^{14}C in vitro into triglycerides, of phosphatidylcholine, phosphatidylinositol, phosphatidylethanolamine, and phosphatidylserine by homogenates and mitochondria of normal and mitotic-phase regenerating liver. The data collected indicated that the reactions of the individual lipids proceed independently of one another. The entry of palmitic acid into the lipids occurred via several pathways, rather than via a common diglyceride precursor.

The incorporation of palmitate into the lipids of enzymes from regenerating liver homogenates and mitochondria usually occurred at a faster rate than that of enzymes from normal liver. The pattern of relative uptakes of palmitate into the lipids of preparations from regenerating liver differed from that encountered in normal liver. [20 references] [Abstracter: M. F. Tripple]

9.13 PROTEIN CONTENT IN BLOOD PLASMA OF RAINBOW TROUT

Koroleva, N. V.
Chemical Abstracts 63, 8781f (September 27, 1965)

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As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States--now and in the future.